Gas Journal

VOL. 292. 109th YEAR. LONDON, DECEMBER 4, 1957. No 4925 PRICE 1/6

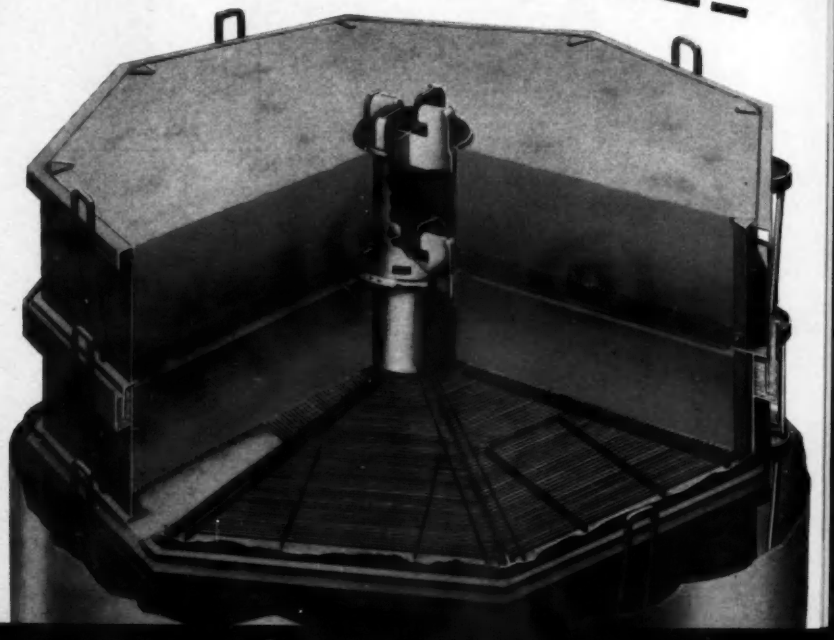
Re-designed containers with complete mechanical handling of oxide

- SINGLE LAYER CONTAINERS WITHOUT BOTTOM PLATES. No grids to remove—No bottom plates to corrode.
- STEEL GRIDS, CLOSE PITCH, INTEGRAL WITH CONTAINER. Long service without recurring cost.
- FULLY MECHANISED CONTAINER DISCHARGE. Minimum labour and supervision required.
- CONTINUOUS HANDLING AND CONDITIONING OF OXIDE. Direct transfer between containers.
- ADEQUATE PROVISION FOR DUST CONTROL.

These and other features are covered by patent applications.

Can be applied to existing installations.

for Holmes Tower Purifiers



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W. C. HOLMES & CO LTD.
nical Engineering Division,
rnbridge, Huddersfield.

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DETROIT

AUTOMATIC CONTROL

OF DIESEL ENGINE DRIVEN GAS COMPRESSORS

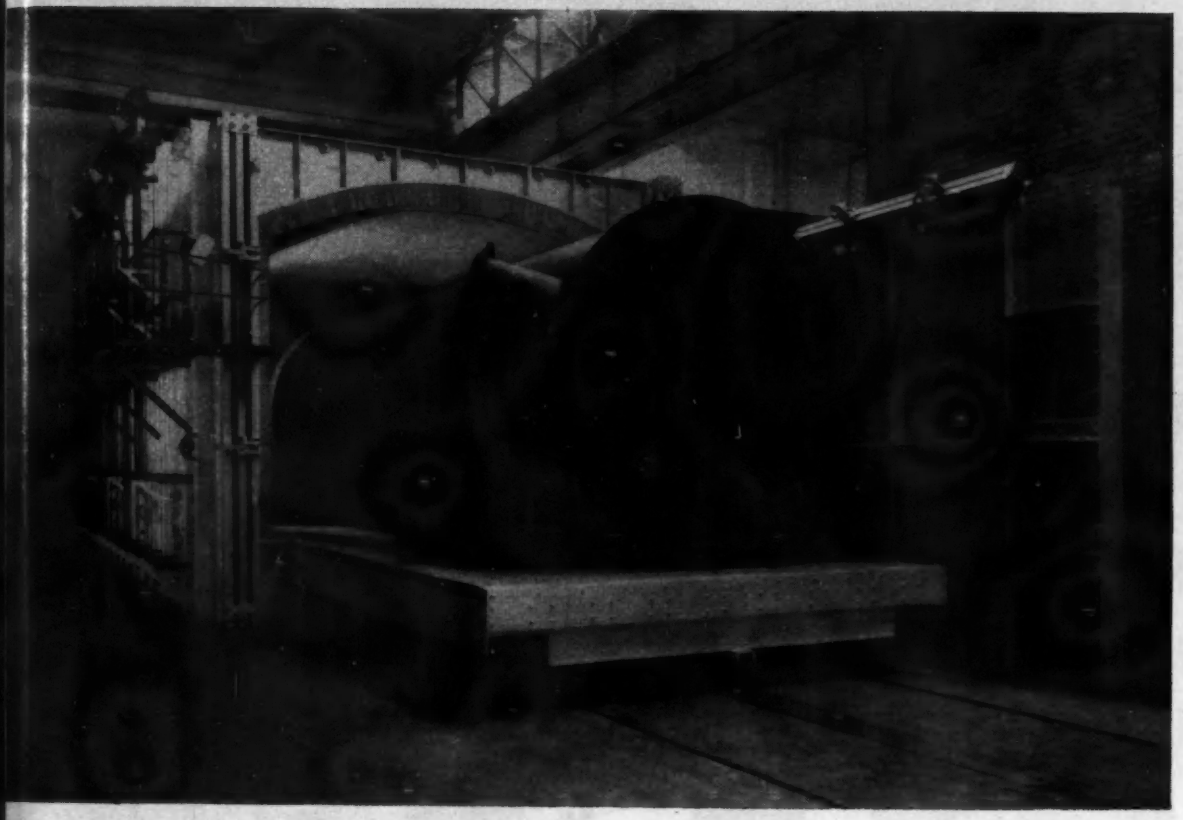
Illustrations by courtesy of the South Western Gas Board and Blackstone & Co., Ltd.

A Diesel Engine driven Compressing Plant which has been specially designed in co-operation with the South Western Gas Board and Blackstone & Co., Ltd. who supplied the Diesel Engine.

This plant is to act as a standby to an Electrically Driven set, and automatically comes into operation in the event of an electrical failure, thus maintaining the distribution of High Pressure Gas.

THE BRYAN DONKIN COMPANY LIMITED

CHESTERFIELD ● LONDON



STRESS RELIEVING PROVED TO BE THE SOLUTION OF STRESS CORROSION CRACKING IN WELDED GAS PLANT

A paper read at the Autumn Research Meeting of the Gas Institution revealed the following information which is of considerable concern to everyone interested in welded Gas Plant.

"The results of the survey on 67 Gas Plants indicated that *all* Plants which contained mild steel welded items in non-stress-relieved condition would most probably crack eventually and that cracking was *more widespread than originally thought*, occurring at any point between the primary coolers and the ammonia scrubbers inclusive, and possibly even beyond the latter."

650° FURNACE TREATMENT FOR ONE HOUR AN EFFECTIVE SOLUTION

Following the research into this problem R. & J. Dempster installed their Stress Relieving Furnace. Investigations reveal that the major factor in governing initiation of brittle fracture in a welded structure is the residual stress arising from the welding process. Stress relieving treatments provide safeguards against the initiation of such failures. The more effective the Stress Relieving the greater the safety afforded. A 650° furnace treatment for one hour has been shown to be fully effective for this purpose.

Your enquiries will be welcomed by:

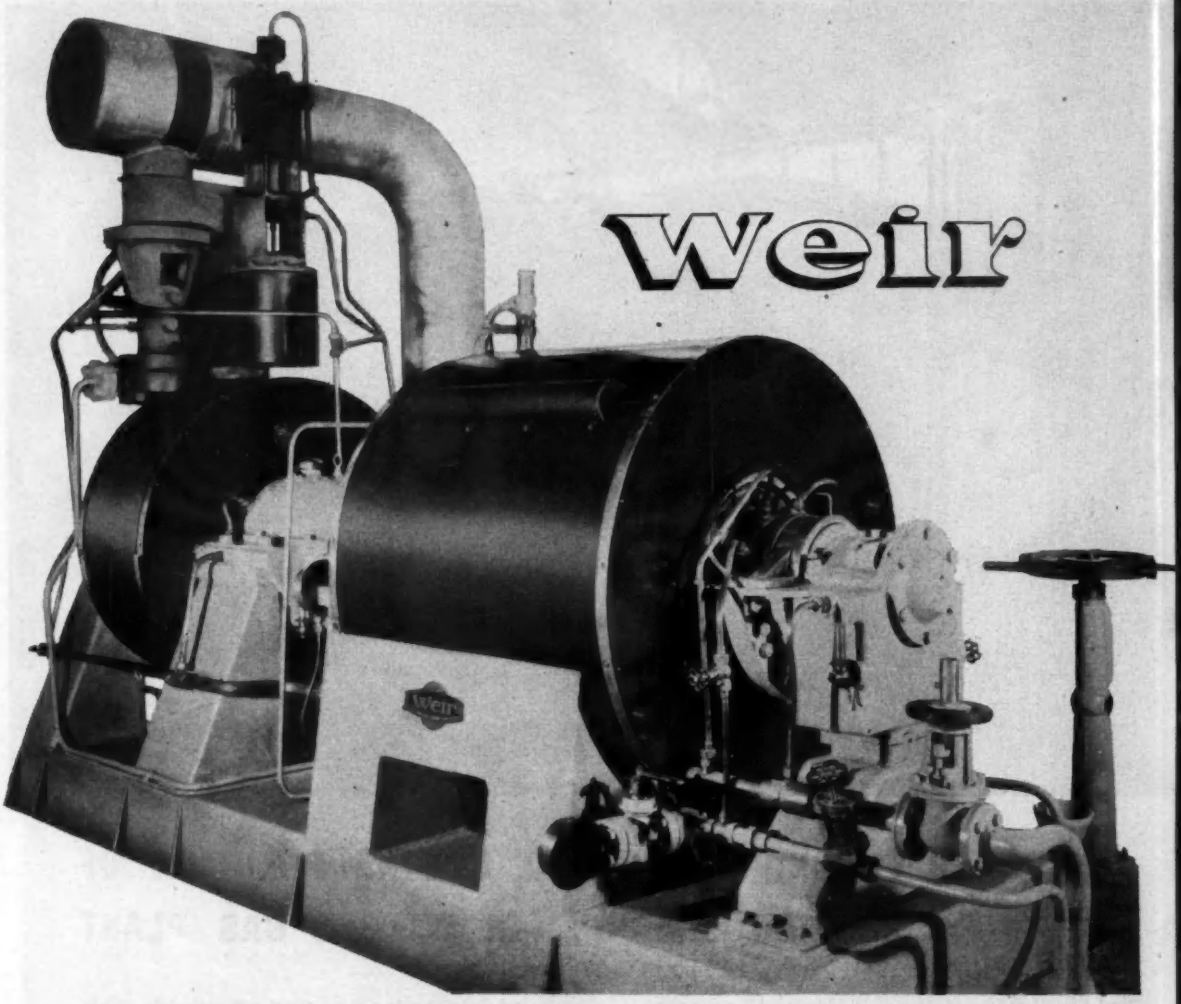
R. & J. DEMPSTER LIMITED

Constructional Gas and Chemical Engineers

GAS PLANT WORKS: NEWTON HEATH, MANCHESTER 10

Telephone: COLlyhurst 2554, 5 & 6
Telegrams: "SCRUBBER, MANCHESTER 10"

London Office: 34 Victoria Street, S.W.1.
Telephone: ABBey 4426 Telegrams: "Scrubber, Sowest, London"



Turbo-feed Pumps

are unsurpassed in reliability and are designed to operate in parallel with electrofeeders or other turbo-feed pumps having a falling pressure-capacity characteristic.

When used as a stand-by pump the Weir cut-in gear automatically brings the turbo-feed pump into immediate operation in the event of electrofeeder failure.

FEED HEATERS • FEED REGULATORS
EVAPORATING AND DISTILLING PLANTS
OIL FUEL PUMPS • DE-AERATORS
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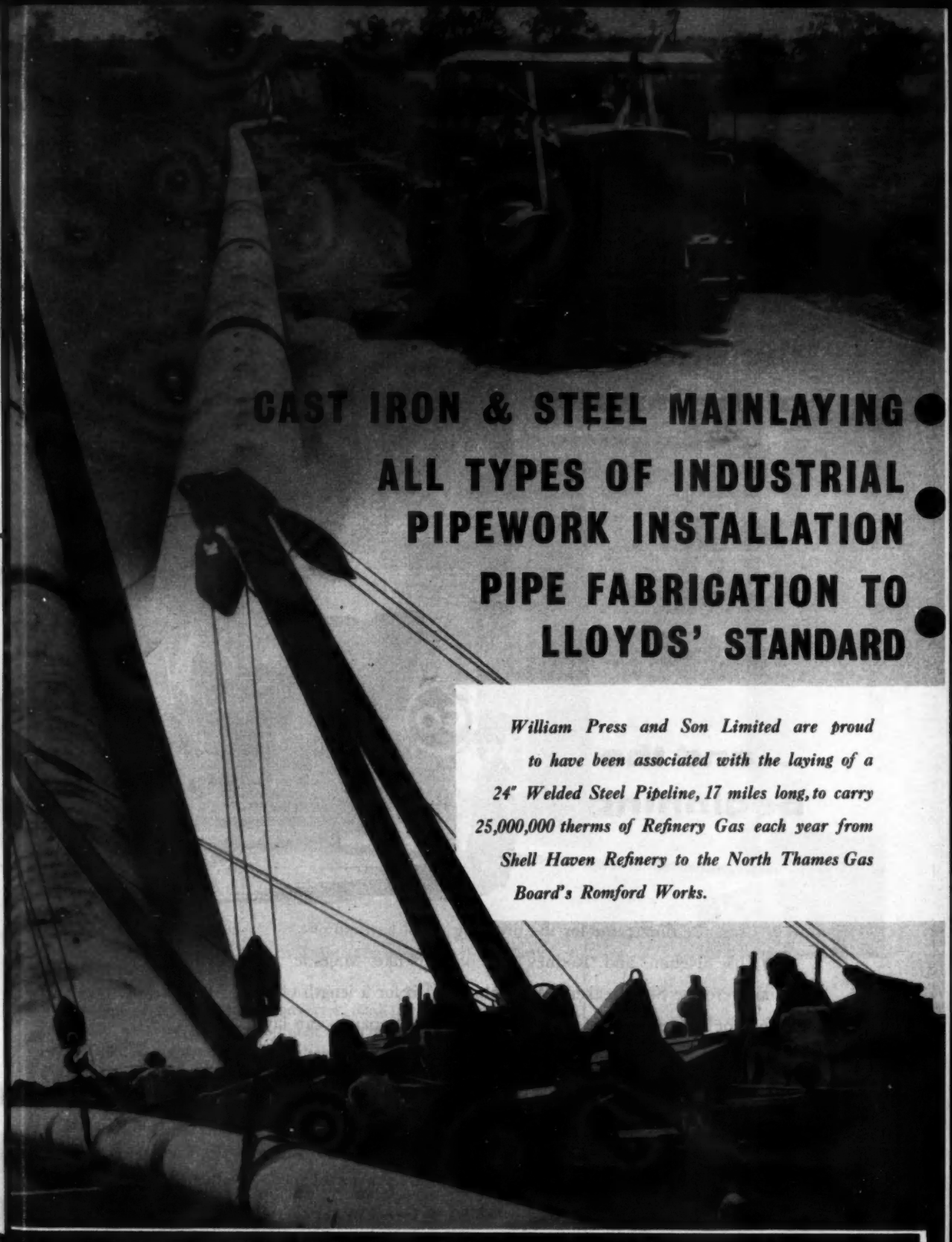
CATHCART : GLASGOW



CAST IRON & STEEL MAINLAYING

ALL TYPES OF INDUSTRIAL PIPEWORK INSTALLATION

PIPE FABRICATION TO LLOYDS' STANDARD

William Press and Son Limited are proud to have been associated with the laying of a 24" Welded Steel Pipeline, 17 miles long, to carry 25,000,000 therms of Refinery Gas each year from Shell Haven Refinery to the North Thames Gas Board's Romford Works.

William Press and Son Ltd.

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Telephone: WHitehall 5731 (7 lines) Telegrams: Unwater, Parl, London

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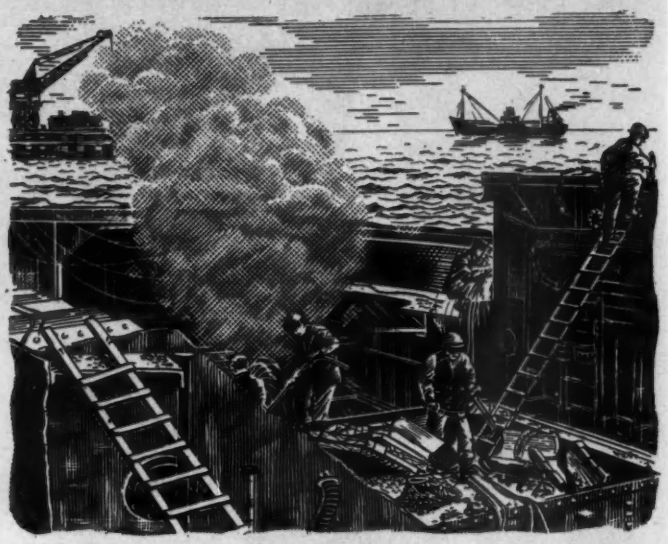

the end of the road...

...and the beginning

When the time came for the breaking up of battleships like 'Nelson' and 'Rodney' and of liners like 'Majestic' and 'Olympic', Wards were the Shipbreakers. When the need is for a length of road, whether in town or country, one of the Ward group of companies can lay it. In 60 years of shipbreaking Thos. W. Ward Ltd., have dismantled over 1800 vessels. In 50 years of road-making they have surfaced or supplied materials for thousands of miles of highways and footpaths as well as for airfields, carriageways and similar hard standings. Remarkable achievements — but then Wards are remarkable people, who provide a service to industry that is second to none.

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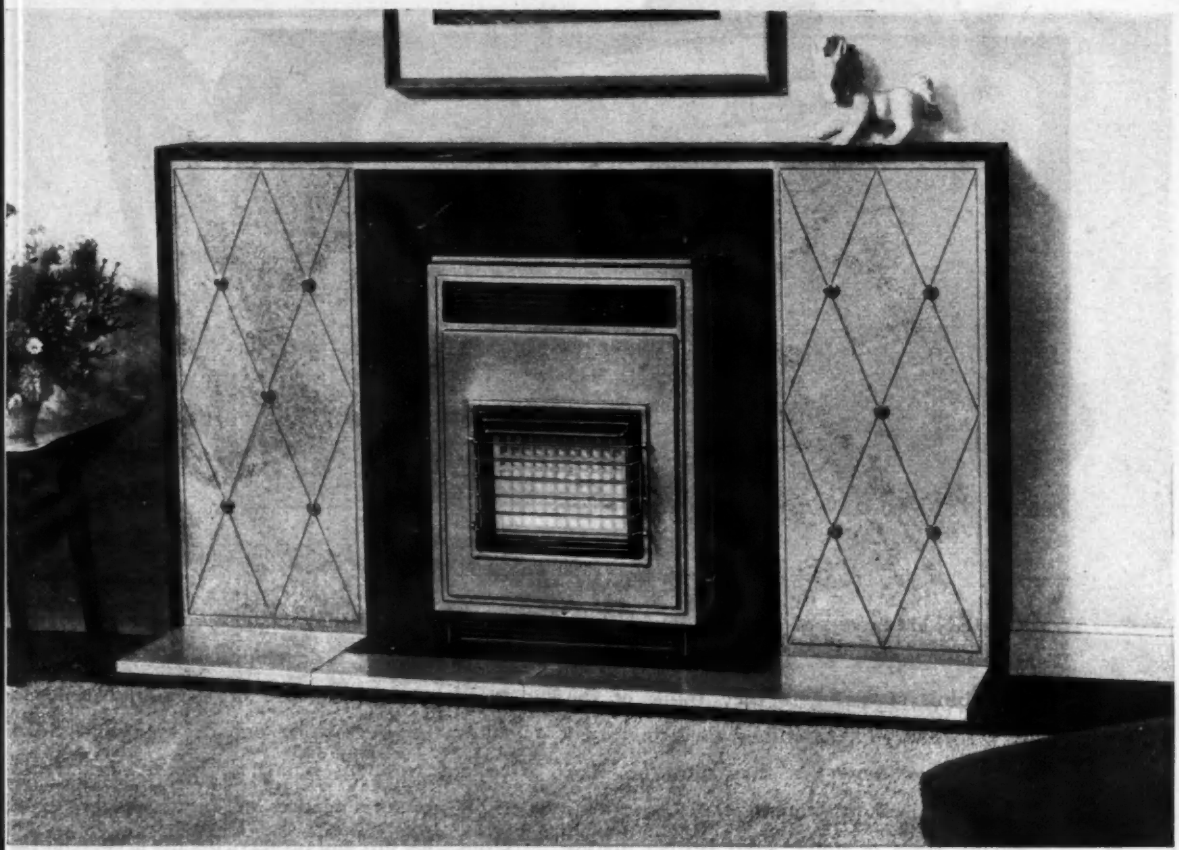
The New Bratt Colbran

'KINGSBURY'

CONVECTOR GAS FIRE



This new 'KINGSBURY' Convector Radiant Fire—outcome of intensive research and development—reaches the highest standards of efficiency yet attained in the field of continuous room heating by gas ; an achievement which means that gas can now compete on equal terms with other forms of heating.

The large radiant plaque of new and unorthodox design gives a warm comforting and even glow over its entire surface—a psychologically important point that the public will be quick to appreciate. In all respects a quality appliance, backed by traditional Bratt Colbran standards of performance, design and workmanship.
Heat input—16,000 *B.Th.U./hr.* (32 *cu.ft./hr. C.V.*500).
Overall sizes—27" *high*, 19" *wide*, 7" *deep* (*excluding guard*).

Automatic electric ignition combined with 3-position tap for accurate control

Attractive colour finishes
Gold/Bronze · Cream/Bronze
Pewter/Black · All Bronze

Economical running cost—maximum efficiency at half rated input

BRATT COLBRAN LIMITED · LANCELOT ROAD · WEMBLEY · MIDDLESEX

When washing machines are Acme-fitted **then** women know they're buying the best . . .

WOMEN are buyers of washing machines. Women are buyers of wringers. And when women think of wringers they think of the Acme. So when your machines are Acme-fitted your customers know that they must be, like the Acme, the best on the market.

Seventy years of good, solid British manufacturing, skill, research, and experience stand behind each Acme—and generations of women know this to be true. Acme is the perfect expression of real and continuous progress in the history of wringing. Thus, every feature for which Acme is famous, has sprung from a known need; has been tested, tried and found successful before it leaves the factory.

Today the new Acme has "pressure indication", a development which, by assuring the correct pressure for every kind of fabric, takes the guesswork out of wringing. Silks, cottons, woollens, linens, now receive exactly the right pressure needed to extract water, expel embedded dirt and preserve the life of each fabric. Thus wringing is made simpler and easier.

Acme does a better job, lasts longer and gives the best results. That's why Acme's reputation is world wide. That's why more than four million women have chosen an Acme in preference to all others. That's why, when your washing machines are Acme-fitted, women know they're buying the best.

ACME WRINGERS LIMITED DAVID STREET GLASGOW SE

RACK AND PINION VALVE

Extra safeguards to prevent corrosion, freer opening and faster shut-off . . . these are a few of the many features about the Willey Rack and Pinion Valve that make it the most reliable ever. Sizes: 2," 3", 4", 6" and 8".

WILLEY
PRECISION VALVES

The Rack and Pinion Valve is a typical example of Willey precision castings. Pinion and buffers are made from a specially selected grade of corrosion-resisting bronze. The body seating is kept free from deposit by means of a coil spring action. Possibility of jamming has been virtually eliminated by precision machining of the pinion teeth. An extra-secure packing gland is incorporated, while precision-machined tapers ensure free opening and fast shut-off at all times. The 2", 3", 4" and 6" sizes are available with screwed or flanged ends.

OTHER FAMOUS WILLEY VALVES

Cast Iron control valves
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...and now

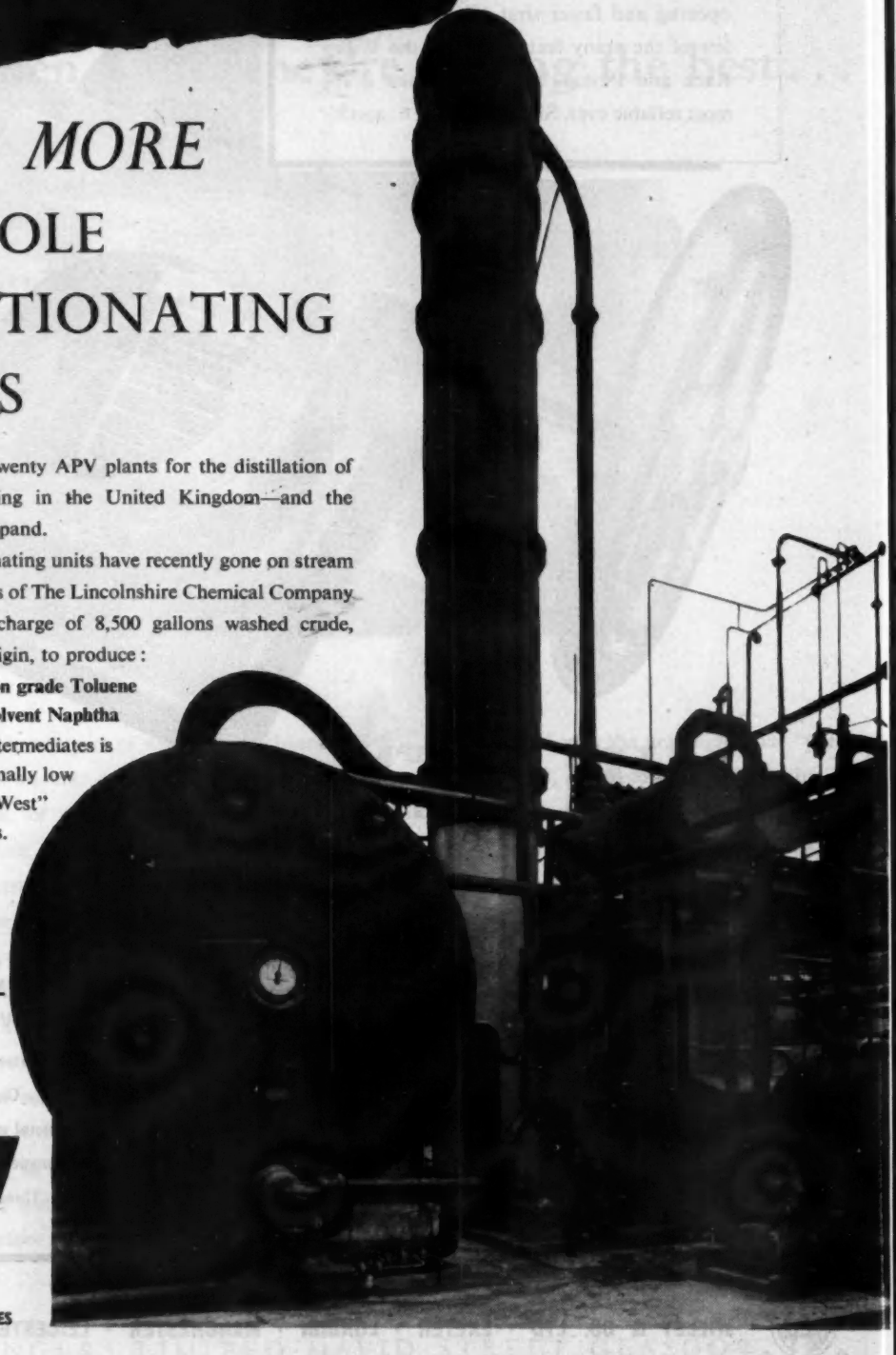
TWO MORE BENZOLE FRACTIONATING UNITS

THERE ARE NOW over twenty APV plants for the distillation of crude benzoles operating in the United Kingdom—and the number continues to expand.

Two new batch fractionating units have recently gone on stream at the Scunthorpe works of The Lincolnshire Chemical Company Ltd. Each distills a charge of 8,500 gallons washed crude, mainly of coke oven origin, to produce:

No. 1 Benzole · Nitration grade Toluene
2°/3° Xylole · 96/160 Solvent Naphtha

A minimum make of intermediates is ensured by the exceptionally low hold-up of the APV "West" columns in these plants.



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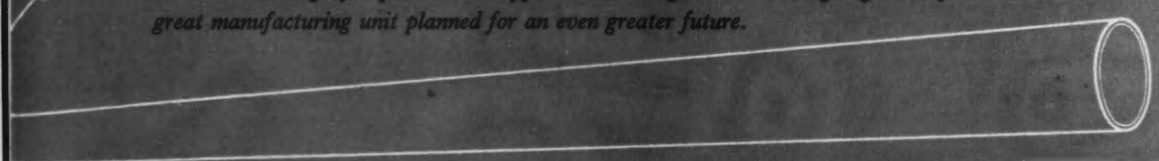
A hundred years of know how...

Every detail is important in the production of copper tubes at Kirkby.

Close temperature control of inter-stage annealing guarantees the correct temper at all stages of processing.

Final annealing of soft temper tubes, carried out in the latest type of electric bright annealing furnace, produces a most attractive finish and notably uniform grain size.

A century of experience in copper tube making went into designing Kirkby—a great manufacturing unit planned for an even greater future.



I.C.I. COPPER TUBES FROM KIRKBY

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The best form of short distance transport

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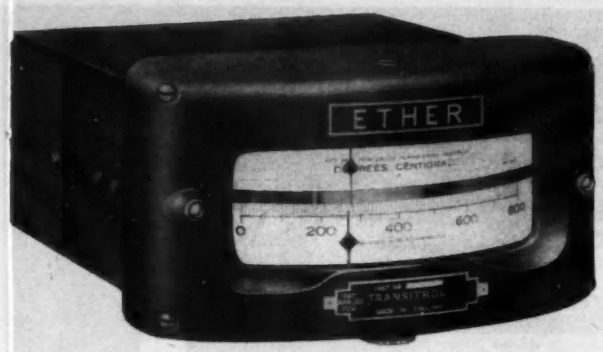


'TRANSITROL'
INDICATING TEMPERATURE-CONTROLLERS.
SERIES 900

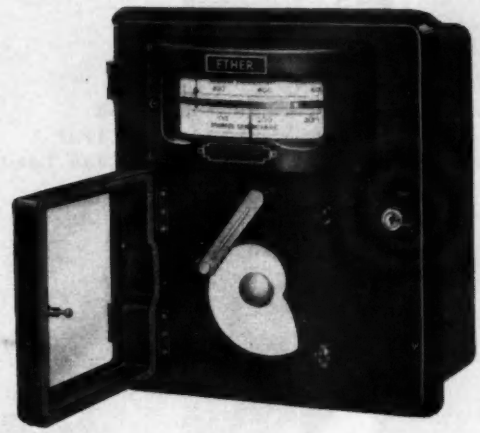
These superior, transistorised, direct-deflection instruments indicate and control temperature with considerable accuracy. Their simplicity of design ensures complete realiability.

TYPE 990 Two-position (on/off Controller
TYPE 991 Anticipatory Controller
TYPE 992 Proportioning (stepless) Controller
TYPE 993 Three-position Controller

Equipment of quality

BY

ETHER LIMITED



'TRANSITROL'
PROGRAMME TEMPERATURE-CONTROLLER, TYPE 994

This unique, transistorised instrument indicates and controls temperature to a pre-determined time-programme. It is designed primarily for controlling heating and cooling cycle of furnace-loads. It costs much less than conventional electronic controllers and is unsurpassed for accuracy and reliability.

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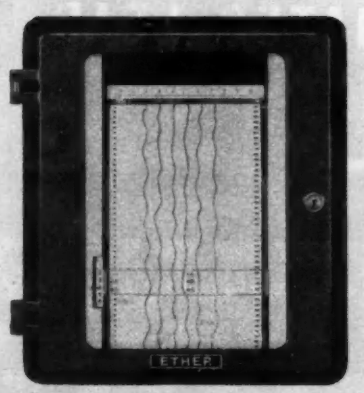
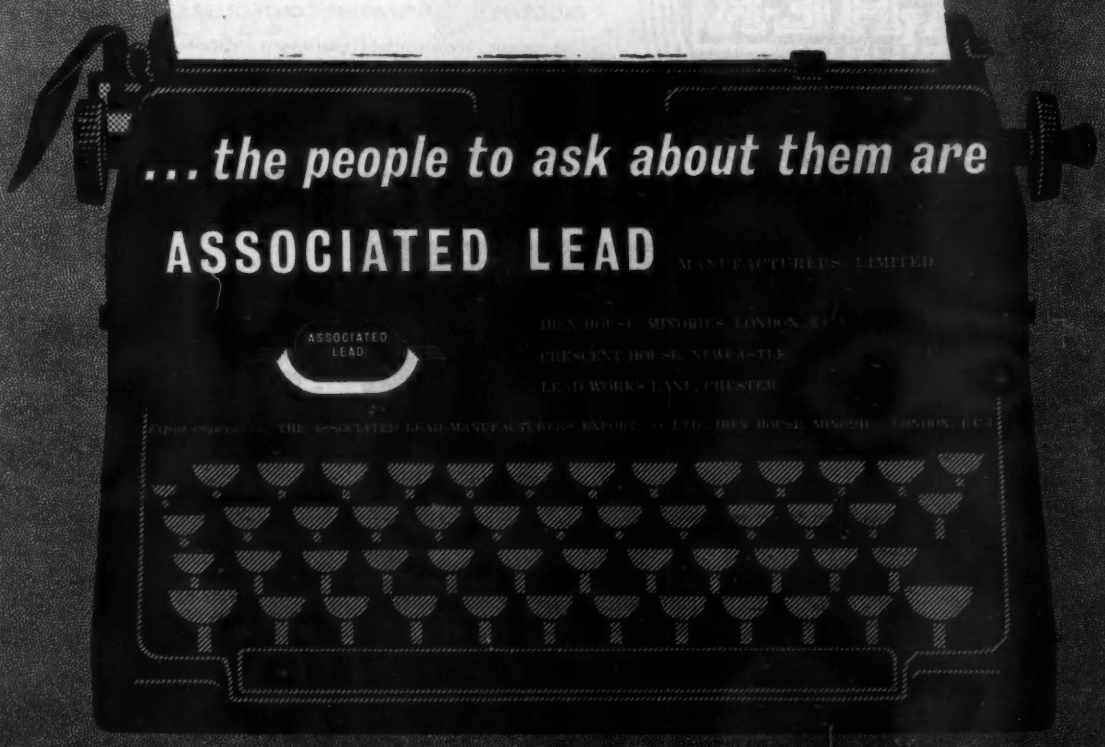


TEMPERATURE RECORDER
TYPE 800

This new RECORDER is designed to record temperatures from 1 to 6 points with complete accuracy. Readings from the various temperature points are distinguished by the contrasting colours on a chart which has a calibrated width of six inches and visual length of twelve inches. The chart is re-rolled automatically. The RECORDER is fitted with a new scanner-type commutator, the working life of which exceeds five million revolutions without variation in contact-resistance. The instrument can be calibrated for use with all types of thermo-couples or radiation-tubes.

If you use any of these...

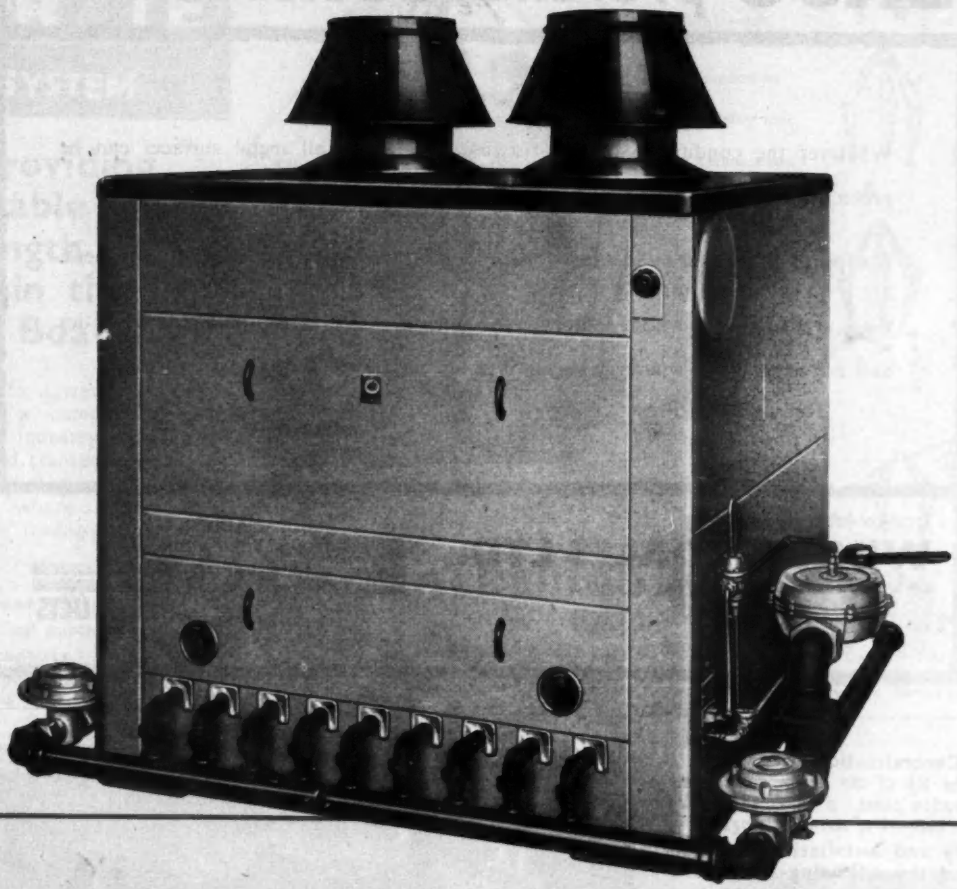
Lead Gas Pipes	Lead Alloy Gas Pipes
Solder	Genuine White Lead Paints
Chemical Lead including Silver Copper Chemical Lead	White Lead Base Paints Hard Gloss or Oil Gloss
White Lead Ground in Oil	Red Lead Paints
Red Lead Ground in Oil	Calcium Plumbate Paints



...the people to ask about them are

ASSOCIATED LEAD MANUFACTURERS LIMITED

Impressive Appearance!



Ideal No. 3-GBD SERIES

GAS BOILERS

An outstanding feature of the Ideal No. 3-GBD Series Gas Boiler is its strikingly handsome appearance.

The jacket has rounded corners and entirely encloses the front platework, and is lined with adequate insulating material.

The front, back and sides of the jacket are enamelled in a most attractive finish of Forge Red, a pleasing shade mottled with a metallic effect to lend it the appearance of a hammered finish. The top portion and the Diverter castings, including Diverter Jacket Ring, are finished in black enamel.

Those parts of the jackets which are removable for cleaning purposes are fitted with neat black plastic handles, while the apertures through which the burner pipes enter the Boiler are framed with chromium-plated strips.

The front platework is painted black and is sealed with asbestos rope to ensure a gas-tight fit.

A thermostat is fitted, with a dismountable head and sheath which enables it to be removed and replaced with the minimum of inconvenience and labour.

All these features result in a Boiler that is eminently suitable for boiler-houses in which both a clean and attractive appearance and the highest functional efficiency are required.

The No. 3-GBD Series Gas Boiler is available in nine sizes, for Hot Water and low-pressure Steam Heating, with ratings from 390,000 to 1,430,000 B.T.U.'s per hour.

IDEAL-Standard

348

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DENSO *prevents* CORROSION

Whatever the conditions, pipes—structural steelwork—all metal surfaces can be protected by Denso Tape . . . above ground, below ground or under water. . . .

Corrosion prevention by the appropriate Denso method is complete and permanent.

Consult the people whose lifelong experience is relied on by Public Authorities and Industry alike—wherever the need arises for protection against corrosion.

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DENSO BRAND ANTI-CORROSIVE PRODUCTS

Manvers Centralization Scheme :
From the top of the newly constructed Coal preparation plant: a small section of the immense network of railway sidings.

Photograph by courtesy of National Coal Board

The supply and installation of these sidings and the adjoining trackwork for the new Coal Carbonization and Benzole Rectification Schemes were entrusted to the Eagre Construction Co. Ltd., by the National Coal Board. Over 9,000 tons of Iron and Steel were used in the construction of the forty miles of track and 230 turnouts and Special Point and Crossing layouts comprising the combined railway Sidings.
Eagre's skilful planning and practical experience in the day-to-day working of Colliery Sidings ensured that this vast scheme was laid efficiently to schedule, and without the slightest interruption of existing Colliery traffic.

for a complete Track Service

Photograph by courtesy of National Coal Board

Work begins at Cadeby: The National Coal Board again entrusts the Eagre Construction Co. Ltd. with a similar project. Earthworks, Drainage, Track Laying and ancillary works for thirteen miles of Sidings are now in progress at Cadeby Main.

In addition to its activities in the Nation's Coalfields the Eagre Construction Co. Ltd. has worked continuously during the past ten years for British Railways, the Gas Board, the United Steel Companies, and has carried out large Power Station Projects for the Central Electricity Authority.

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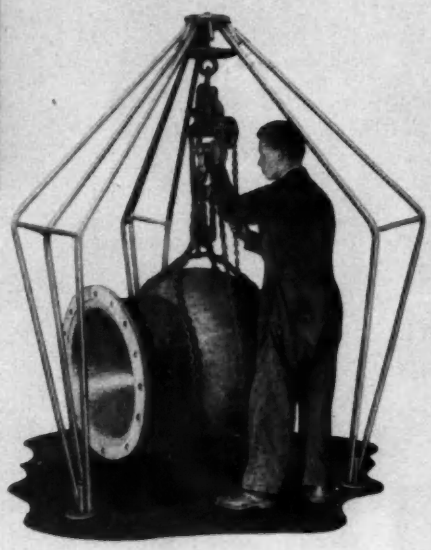

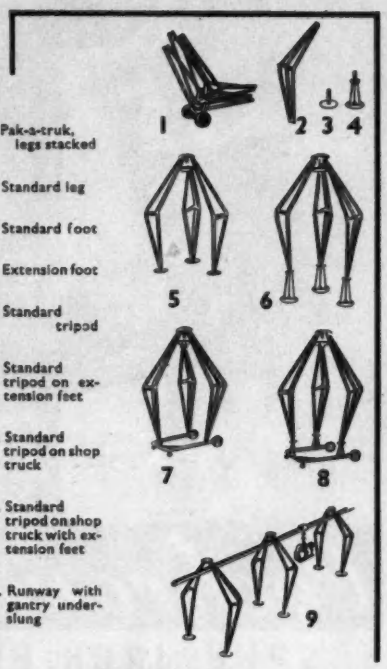

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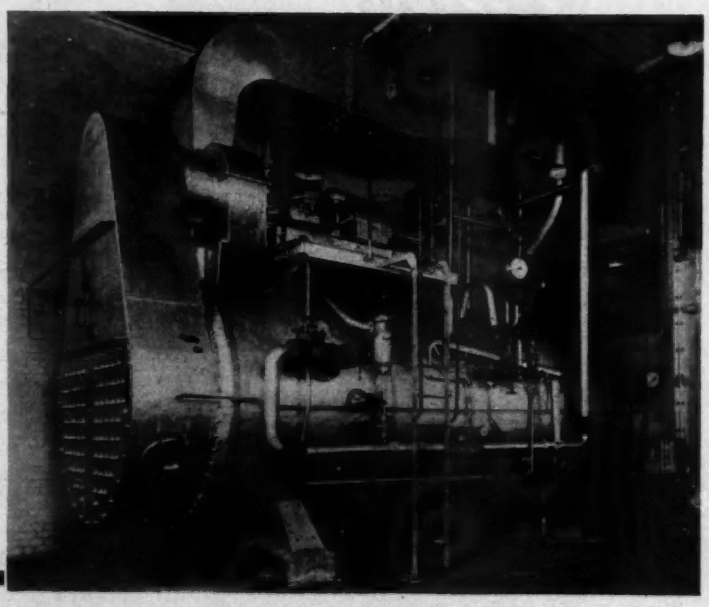
n answer to rising coal costs . . .

WASTE HEAT RECOVERY

IN THE

Gas Industry

e of six Spencer-Bonecourt Waste Heat lers operating on the West-C.O.L. ermittent Vertical Retort Carbonising nt at Howden Gas Works—Northern s Board.



consult the specialists in waste heat recovery

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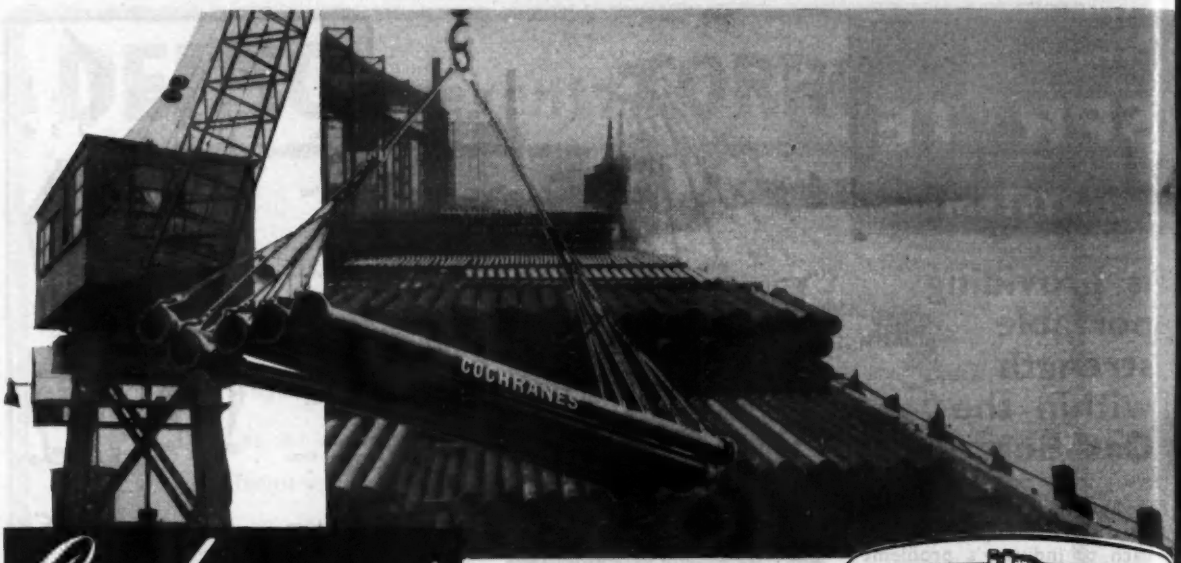


Cochranes

Coast-wise steamers load here for delivery to ports all around the British Isles, including Northern Ireland.

SPUN IRON PIPES & FLEXIBLE JOINTS

Cochranes Screwed-Gland Flexible Joint: up to 10" diameter.

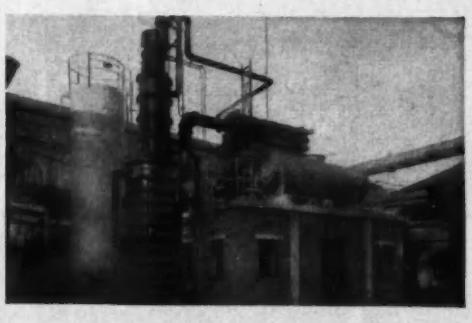
Cochranes Bolted-Gland Flexible Joint: 4" diameter and above.

All Cochranes Spun Iron Pipes are works hydraulically proof tested to 500lb. per square inch.

Cochranes (Middlesbro') Foundry Limited, Ormesby Ironworks, Middlesbrough

Wilton

GASWORKS AMMONIA PLANTS



Wilton crude concentrated ammonia plant

PROCESS PLANT

for crude concentrated ammonia
pure ammonia
sulphate of ammonia
aqueous ammonia
anhydrous ammonia

Contracts for complete ammonia plants and other gasworks by-product plants can be carried out in their entirety, from initial planning and technical design to construction and commissioning, including structural, civil and electrical engineering work.

Chemical Engineering Wiltons Ltd

SIMON ENGINEERING GROUP

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CW6a

The native boy above is whitewashing Enamel-coated pipe sections to reflect away the rays of the hot tropical sun prior to lining up and welding. A small but not unimportant cog in a world-wide organisation.

"Bitumastic" Coatings are giving protection to pipelines in all climates and in all conditions of terrain. We believe we can solve your corrosion problem. Why not drop us a line today?

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for protecting GAS, WATER & OIL PIPELINES

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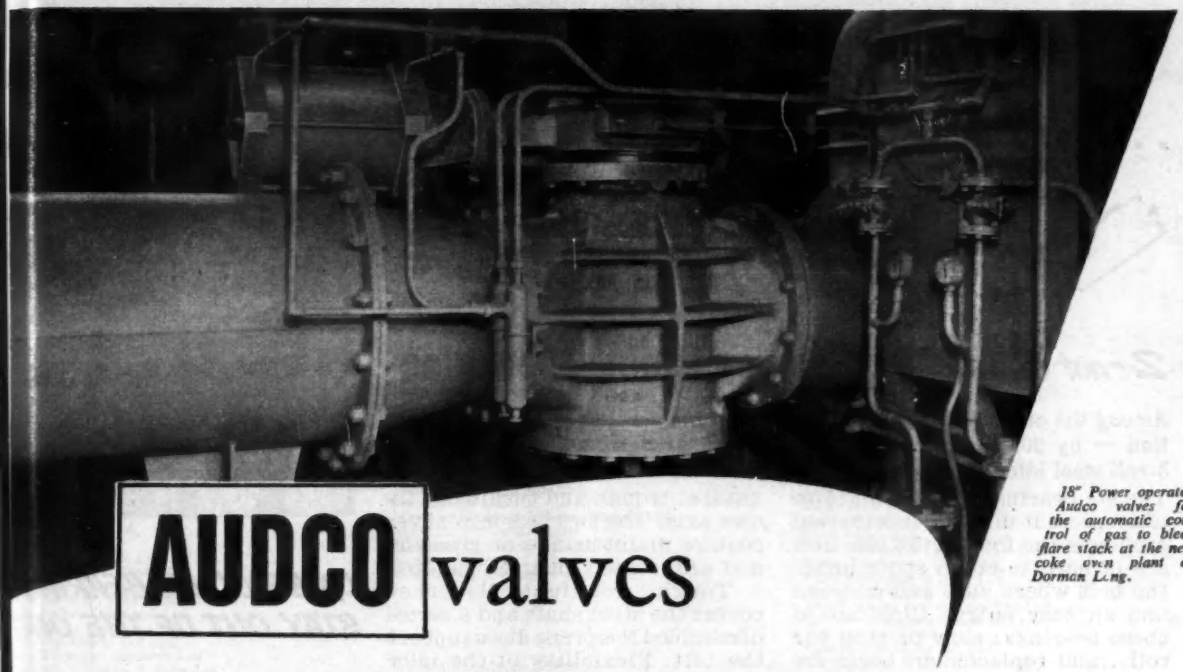

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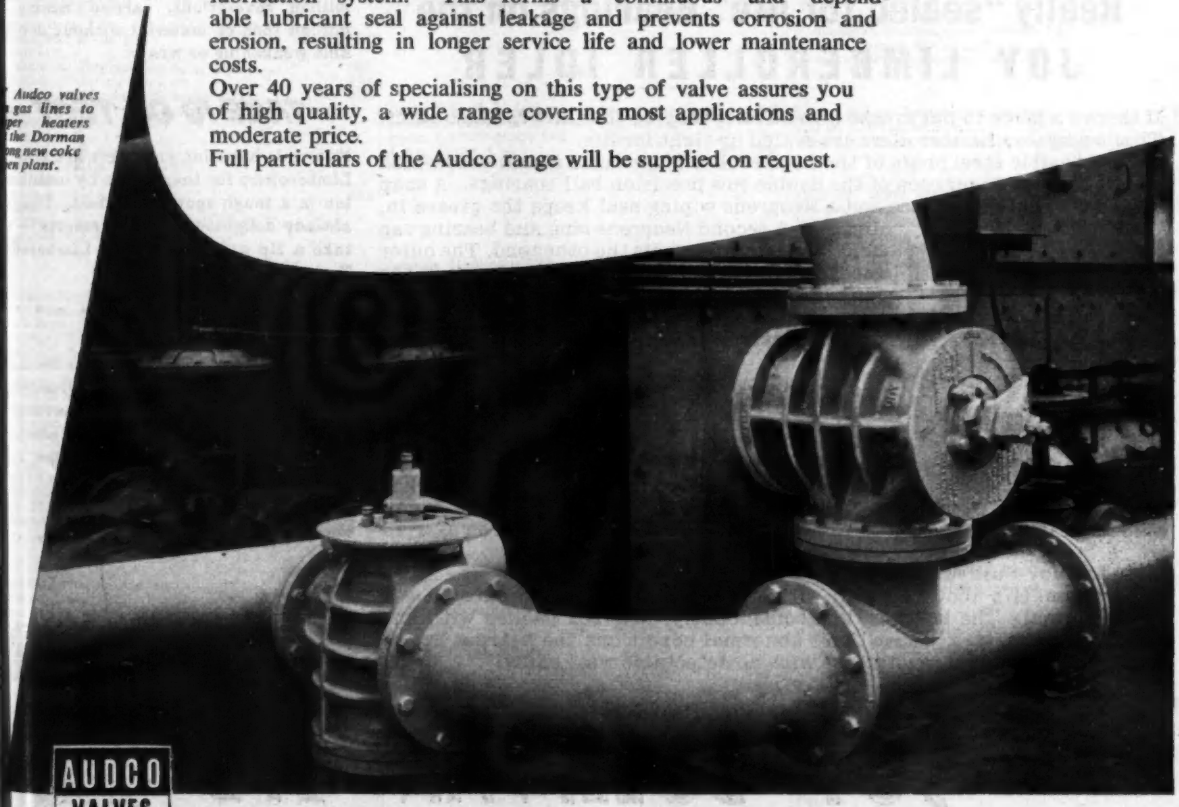

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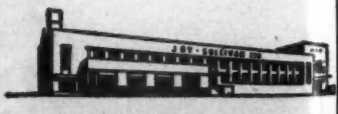

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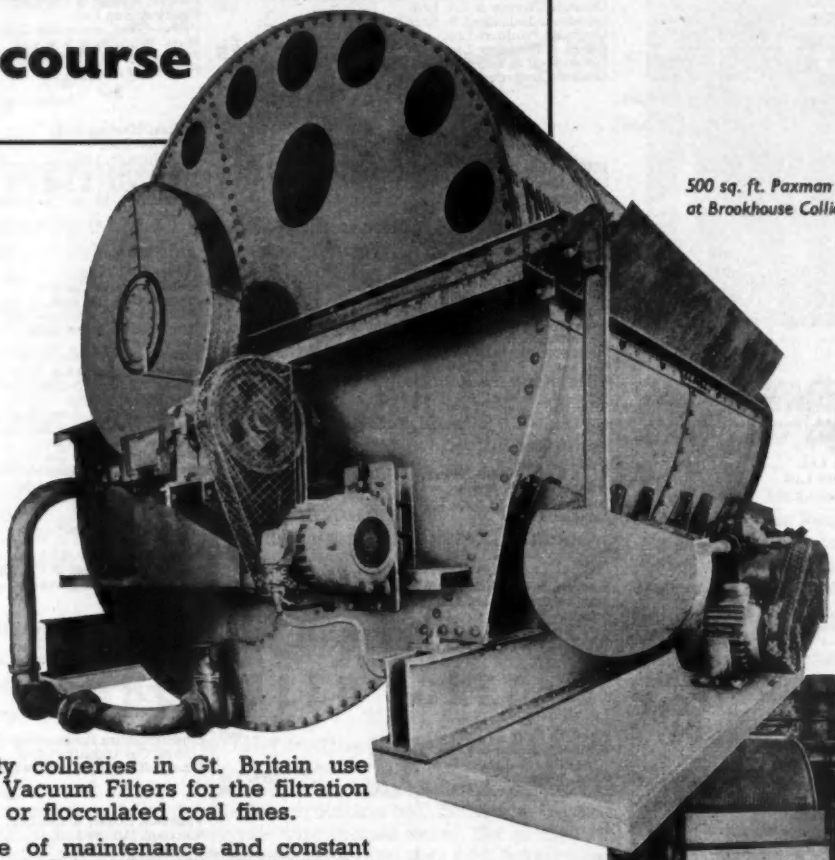

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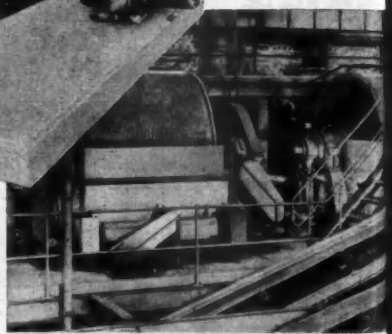

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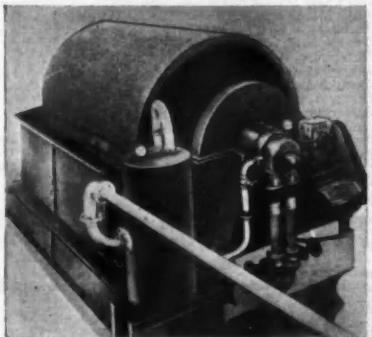

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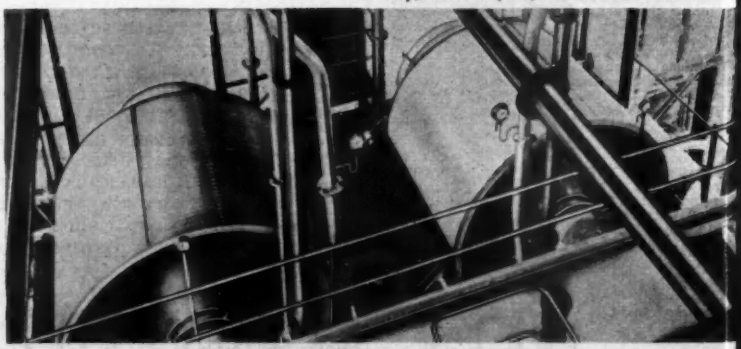

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Gas Journal

VOL. 292 NO. 4925 December 4, 1957

109TH YEAR

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TECHNICAL EDITOR: Charles J. P. de Winton, T.D., M.A., M.Inst. Gas E., M. Inst. F.

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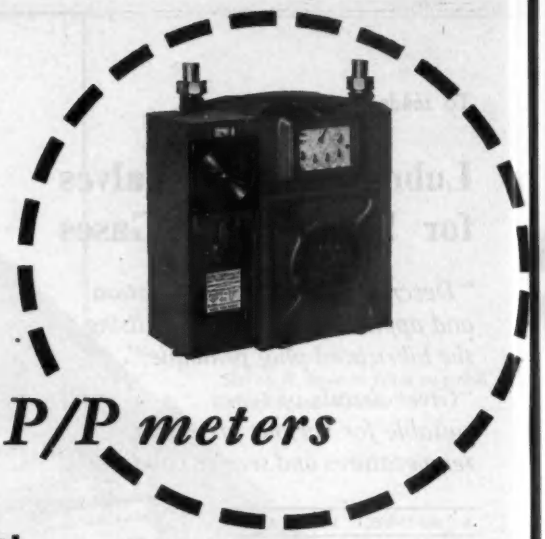

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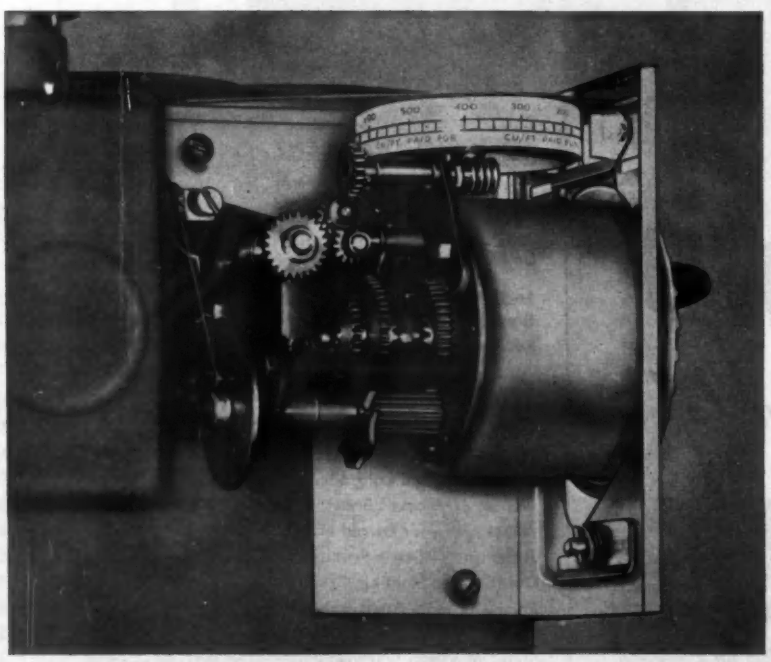

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Gas Journal

VOLUME 292. No. 4925. DECEMBER 4, 1957. 109th YEAR

The Gas and Electricity Debate

THE debate on the gas and electricity industries on November 26 revealed the gas industry delicately balanced between the promise of new techniques and the undeniable threat of declining business. On the whole our industry came out of the fray remarkably well but attackers and defenders alike would agree that this is a critical period for gas.

Opening the debate, the Paymaster-General, Mr. Reginald Maudling, said that over the last three years the gas industry had been facing very heavy competition from electricity and oil, and competition in varying degrees in the domestic and industrial markets. As a result, the general picture of the gas industry was one of growing demand from the industrial and commercial sector rather more than offset by a falling demand in the domestic sector. Experience in recent months, however, had shown a small up-turn in the total demand. By and large, in the face of this heavy competition the gas industry had been having a difficult time. It seemed quite clear, therefore, that the industry must concentrate upon more efficient means of production, particularly on methods of using lower-grade, cheaper coal, and on more efficient distribution, particularly on solving the very awkward and growing problem of the load factor about which they heard a great deal in relation to electricity but which was equally important to the gas industry.

Mr. Maudling's review of technical developments in gas making was comprehensive and flattering. 'The value of this general picture of the experiments that the industry is making,' he said, ' is that it shows the extraordinary technical ingenuity and the fertility of mind in the gas industry. The industry is facing great difficulties. In many ways its competitors have monopoly positions which the gas industry cannot expect. For instance, electricity has a monopoly of lighting and oil has a monopoly of traction. The gas industry has to fight for its existence. It is doing so, and the fact that it is pursuing so many new and interesting possibilities of providing energy shows that competition is producing in the gas industry a healthy position. To the extent to which it can, by experiment and research, find new ways of producing energy on an economic basis, it is clearly contributing a great deal to the solution of the basic energy problem of the country.'

Last week we commented on the speech made by Lord Mills at the Autumn Research Meeting and pointed out that he made virtually no reference to a fuel policy. Mr. Maudling did at least mention co-ordination of the gas and electricity industries. Both were processors of primary fuel, he remarked. They were interchangeable in some things and not in others. There were some functions which gas performed better than electricity, and some things which electricity did better than gas. In one way or another both competed with solid fuel and with oil. 'The object of any fuel policy,' he said, ' must be to reach a point at which both gas and electricity contribute to the national energy consumption that portion which is most economic and most efficient. How do we achieve that? We cannot do it by detailed planning. It is very tempting for one sitting in one's office in Whitehall to think that one knows best and to say that electricity should do this and gas do that. The detailed considerations become too complex for any central direction to be able to achieve effective detailed results. Moreover, it is very important in this as in so many other matters to give the maximum freedom of choice to the consumer. We therefore believe that the basis of co-ordination must be competitive, as the Ridley Committee itself pointed out. On the other hand, competition alone, without any sort of Government guidance, is not adequate for our problems.'

There were two reasons why the Government must take a hand in these matters. The first was the balance of payments problem. An industry might find ways of making its product more competitive in the home market at the cost of a considerable additional burden on the balance of payments. What might suit the industry might not suit the economy and therefore the Government, too, must take a hand in the settling of the capital programmes to avoid any element of duplication. In all these things it was difficult to tell where competition ended and duplication started. 'We think,' he said, ' that competition must continue to be the basic principle of the co-ordination of our fuel policy, but it must be competition with a good deal of Government guidance, for which the Statute provides.' The Ridley Committee considered this matter at great length and since then the Herbert Committee on the electricity

industry had reported. Circumstances changed much in this industry and a case might well arise in the not too distant future for a similar inquiry into the economics of the gas industry. 'If that should happen, perhaps we can look into questions of the co-ordination of the two industries.'

Principal speaker for the Opposition was Mr. Alfred Robens (Blyth) who, in the course of an astute analysis of the two industries' report, had some pointed remarks to make about the importation of liquefied methane. Referring to the investigation into new methods of producing gas, Mr. Robens asked whether liquefied petroleum gas was worth it. He understood the Gas Council were looking into the possibility of importing in liquid form natural gas from the Western world, where it was being burnt to waste, which indicated that we could get it very cheaply. It would not be the first time that a waste product for which there was a sudden demand because of somebody's ingenuity became a high-priced product. He did not believe anybody could say whether or not the price at which natural gas waste product in liquid form was available to us would remain at the economic price it might be at the moment to justify the tremendous cost of importing it.

To liquefy natural gas it had to be brought down to a temperature of about minus 250°F., and if it were put in an ordinary steel tank it would go right through the bottom of it. Special tankers would therefore have to be built to carry it. 'On the face of it,' said Mr. Robens, 'I should have thought that if all the resources of the Gas Council and of the gas boards were directed to the gasification of our indigenous coal we should be putting our scientific skill, and our money, to better use than in trying this liquefied gas experiment. This is a luxury experiment. It is fraught with great dangers. I do not believe that its economics have been worked out, or that anyone is in a position to say what the price of the gas now being burned to waste in the United States would be if we built part of the industry on it.' (Here Mr. Maudling interrupted to say that it was not a project, but an experiment, the economics of which had been worked out with great care.) Mr. Robens hoped the Government would look at the strategic position and the fact that dollars were involved. 'If,' he said, 'we permit the Gas Council to go ahead with this without regard to all the other aspects involved, it is entitled to say that the task is to produce cheap gas, irrespective of the effects on the coal industry or anything else. I criticise this as a purely luxury experiment, but my main criticism about the gas industry is that it has been so slow in its progress towards the complete gasification of our indigenous coal.'

There were plenty of other opinions expressed, many of them chestnuts. For example, Mrs. Lena Jeger (Holborn and St. Pancras, South) complained of the 'extraordinary waste' of overheads in having showrooms for gas and electricity appliances in different parts of a town, and Vice Admiral John Hughes Hallett (Croydon North East) asked why common accounts departments and sales organisations had been enforced when the industries were nationalised. Other speakers followed up the previous day's discussion and complained of the promotional advertising indulged in by both industries. However, Mr. Raymond Gower (Barry) said he did not necessarily accept the arguments in favour of merging the administrative and distributive side of the two industries—for one thing their areas were not always the same. Nor did he accept that advertising in a nationalised industry was reprehensible. 'It has been done well and reasonably and, on balance, it is right that the consumer should have the merits of these alternative forms of domestic power brought to his or her notice in an attractive manner so that people can make their own choice.'

There were three other topics of interest: Careers, Consultative Councils, and purchase tax anomalies. Mr. Arthur Palmer (Cleveland) thought it was useful occasionally to appoint an outsider, but he was quite certain the best appointments should be made from inside the industry. He continued: 'It should be one of the greatest achievements of these nationalised industries that they can open a career to the young man or woman of talent. Anyone coming into these industries, from any kind of background, should be told from the beginning that, given ability, drive, and all the rest of it, the way is open to him to the very top. To encourage stronger, more able, more independently minded leaders of these industries I should like to see opportunities given to them to travel, to pick up good ideas in other countries—I do not mean going round in parties, like a lot of penguins—but individual travel with a definite straightforward mission and with a set task to perform.' He went on to refer to the good labour relations enjoyed by these industries, 'but I do not think that it can be argued seriously that wages and salaries are particularly high.'

Consumers' councils were mentioned by Mr. Tudor Watkins (Brecon and Radnor), who thought it a contradiction that members of the Consultative Council, whose job it was to defend the consumers and speak on their behalf, should appear to be agents of the board, on the same platform as members of the board, advocating the board's proposals. He received support from Vice-Admiral Hallett, who maintained that consumers' councils had been one of the more disappointing features in the working of the nationalised industries.

Last week we commented on Mr. Oatley's full-blooded attack on purchase tax anomalies in his Chairman's statement to Cannon shareholders. With characteristic foresight he saw that a copy of his statement reached all M.P.'s by the Saturday before Tuesday's debate. If there was any danger of the ridiculous—indeed, scandalous—purchase tax position being overlooked, this acted as a timely reminder. It fell to Mr. Gerald Nabarro to act as the spearhead of the attack and he did so with his usual eloquence. Having explained the unfairness of the purchase tax on certain gas and electric appliances, he demanded an explanation of the Chancellor's 'economics of the lunatic asylum.' Alas, he was to be unlucky, for when Mr. David Renton, Parliamentary Secretary to the Ministry of Power, who replied to the debate, dealt with this point it was to maintain that it was no part of his duty to poach on Treasury preserves. Whereat Mr. Nabarro exploded, saying that it was at least the fifteenth time he had listened to that explanation, and when were they likely to get some action? Mr. Renton said in reply: 'My hon. Friend seemed to threaten me personally with another Private Member's Bill,' and passed on to other matters.

In his speech Mr. Renton said: 'Up to the present

the gas industry has had as its slogan, "The gas industry makes the best use of the nation's coal." With great respect to all engaged in the gas industry, I would say that that slogan today would more accurately be that "The gas industry makes the best use of the nation's best coal." For the future, one hopes that in the light of what has been said today, the gas industry will do its best to make more use of some of the nation's worst coal. The industry has plans, which will take a little while to come to fruition, but sound plans nevertheless, for hydrogenation by the North Western Gas Board, for the Lurgi plant in the West Midlands, and for making larger use of low-grade smalls in Scotland.' The decision had been taken to experiment with imports of liquid methane. Mr. Robens had described that as a luxury experiment. A great many experiments appeared to be luxuries when they started, but became necessities when they had been proved. This might well be an experiment which proved a very successful one. It was already known that the economics of it were very attractive indeed, and that if the technical, practical difficulties could be overcome there was a very good chance of the gas boards being able to get much cheaper gas than they had ever enjoyed before.

Mr. Robens had asked whether, when the area boards had completed their grids, there would be any possibility of a national grid and whether there would be the legal powers for it. 'The answer is that the legal powers are most certainly there,' said Mr. Renton, 'and it will be a matter for the gas boards, meeting together in the Gas Council, to decide, and no doubt, if necessary, to approach my right hon. Friend for authority for the capital expenditure. Then it will be necessary to consider the matter in the way these matters always are considered. The most probable need for what I would call an inter-area board gas grid would be for one from Wales to London. The Wales Gas Board with its mass of coke oven gas is likely to have a very large exportable surplus at some time in the future. Possibly London or the Midlands are the places where one may consider that surplus being used, so the beginning of a national grid might merely be the linking up of South Wales and London or the Midlands. A technical point which should not be lost sight of is that if we did have such a grid on a long distance basis, then the size of the pipes and the pressures behind them might have to be very much larger than those of the ordinary area board grids. The reason why the gas industry has been spurred on to make its new development is that it was faced with competition from electricity. We shall continue to welcome competition between boards. We also welcome, and are anxious to preserve, the freedom of consumer choice.' He did not think it right to say that the electricity industry would expand at the expense of the gas industry. 'I see no reason why the gas industry should not obtain some increase in business.'

And on that rather optimistic note the debate concluded. Perhaps the most encouraging feature of all was the general reluctance to see an industry which had served the nation long and well cast aside in favour of the still uncertain marvels of nuclear energy. The value of the gas industry is clearly recognised by a substantial section of the House and, on this showing, they will oppose any attempt to deny it its proper chance in the future fuel pattern.

Underground Gasification

ALTHOUGH our only fossil fuel, coal, is undoubtedly still available in very large quantities, it seems inevitable that it should become increasingly costly to extract. There is a tendency for coal conveniently near the present pit shafts to be worked out and this means that coal must be transported longer distances underground or shafts must be sunk deeper. At the other extreme are the very shallow coal-measures. Near the surface this coal can be extracted by open cast methods but at depths of 200 ft. or so and from poor coal seams, it would be too deep to extract it by open cast working and, because of its indifferent quality, too costly to mine by conventional mining techniques. Since the ideal form of fuel is undoubtedly gaseous or liquid, the Ministry of Fuel and Power decided in 1949 to carry out experiments in the underground gasification of these poor seams.

Experiments in firing the coal in the seam and collecting the resultant gas were also being carried out in the U.S.A., Russia, and on the Continent. The gas was a form of low grade producer gas, of value only as a means of steam raising and for use in gas turbines, with the possible use as a raw material for the production of synthesis gas. It would, therefore, be of little interest to the gas industry as a source of town gas. For this reason, perhaps, gas engineers might be forgiven if their interest in the project, if any, was academic.

When the underground gasification project was originally begun in 1949, the ways and means of carrying it out were practically unknown and the officials of the Ministry of Fuel and Power had to start from scratch. Their chief weapon in attacking the problems involved was an unbounded enthusiasm and a determination that however long it took, success would ultimately come. The first techniques to be tried out were the gasification of the seams by working from the surface, and drilling into the seam from two directions, blowing air into the burning seam through one boring and drawing off the gas from the other. This was the accepted practice at the time and proved to be of such difficulty that it was the cause of the project being abandoned on the Continent. About a year ago, however, the Ministry of Power, as it had then become, decided to hand over the project to the N.C.B. who, unwilling to involve its scientific staff in work of this type, contracted out the work to Humphreys and Glasgow Ltd. for development. By this means the experts from the Ministry could be maintained on the project but would now be employed by the contractors, who took over control last March.

One of the greatest difficulties to be faced in the exploitation and development of such projects is the time necessary to carry out the experiments. It is not possible to get the answers to problems that arise by research in the laboratory, but large scale experiments must be carried out in the field. The time taken to prepare the site for each experiment is long and the conditions under which the work is carried out are tough. In fact the appearance of the experimental site at Newman Spinney, near Chesterfield, might take one back a century or so when the development of some of the coalfields in Great Britain was at its height.

In the last eight years some very important techniques have been worked out, among them the 'blind borehole' process. In this process a shaft is sunk to the depth of the coal seam and of a diameter large enough to allow men and materials access to the seam. A gallery is driven underground and from this gallery the bores into the coal seam are drilled at right angles. Into each bore, which is about 12 in. in diameter, and 240 ft. in length, is placed an airpipe. In this pipe are a smaller tube through which butane can be taken to assist in lighting the fire in the seam, an electrical ignition system, and a flare for the initial lighting of the fire. The gas formed will come back along the bore, up the shaft and be utilised on the surface. So far only single bores have been actually lit, but a four-bore project is being prepared and a set of several double ten-bore pilot projects should be started up in pairs by the end of next year. The gas so made will raise steam for the production of electricity under the control of the Central Electricity Board.

In the past the gas industry's view on underground gasification has been somewhat detached. It was difficult to see how such a gas with a calorific value of less than 100 B.Th.U. per cu.ft. could have any possible application as town gas. Even to transport it to the nearest village or country town would have been hopelessly uneconomic and the short life of a site would deter anyone from putting down permanent plant on the surface. Even in the case of Newman Spinney, the site must be restored to farm land and handed back in ten years. The electrical generating plant there is obsolescent and has been taken out of one of the older C.E.A. stations. On the face of it, therefore, the whole project might appear as an enthusiast's dream with little practical application.

In our opinion, however, this view is too gloomy. It has taken eight or nine years to get as far as the pilot plant stage and in that time a promising technique has been arrived at. During that period, too, tonnage oxygen has been made available commercially, advances in metallurgy would seem to point to suitable metals becoming available for its use, and advances have been made in hydrogenation techniques.

If therefore all these developments can be brought together, a gas of at least 300 B.Th.U. per cu.ft. should become available by the use of oxygen instead of air, and by hydrogenation of the inert free producer gas, calorific values within and above the range of town gas should become possible.

The real goal which the contractors are aiming at, however, is the production of synthesis gas and, ultimately, synthetic oil fuels. Success or failure rests with the contractors. The N.C.B. are purveyors of solid fuel and we think that to have handed over this particular project was a wise decision on its part since, if successful in its ultimate object, there should be scope for considerable application of these techniques in other coalfields in other parts of the world.

Diary of Forthcoming Events

December 5.—SOUTH WESTERN G.C.C.: 34, Bridge Street, Taunton, 11 a.m.

December 5. — INCORPORATED PLANT ENGINEERS (SHEFFIELD AND DISTRICT): Annual dinner and dance, Grand Hotel, Sheffield.

December 5.—WALES AND MONMOUTHSHIRE JUNIORS (N. WALES SECTION): 'Small Works Management' by R. A. Davies.

December 5.—SOCIETY FOR ANALYTICAL CHEMISTRY (MIDLANDS SECTION): Gas Showrooms, Nottingham. Discussion on 'Non-aqueous Titrations." 7 p.m.

December 5.—I.G.E. (NORTHERN SECTION): Market Street, Newcastle-on-Tyne: 'The Common Front in Sales,' by S. Black, J. K. Inwald, and S. C. Watson. 2.30 p.m.

December 5. — INSTITUTE OF FUEL, MERSEYSIDE SUB-SECTION: Liverpool Engineering Society's Room, 9, The Temple, Dale Street, Liverpool. 'The Operation and Maintenance of Fuel Economisers,' by H. J. Gardner. 7 p.m.

December 6. — INSTITUTE OF FUEL (SOUTH WALES SECTION): Cardiff. Joint meeting with Coke Oven Managers' Association. 6 p.m.

December 6.—LONDON AND SOUTHERN JUNIORS: Caxton Hall, S.W.1. Annual reception and dance. 6.45 p.m.

December 7. — SCOTTISH WESTERN JUNIORS: Albany Street Social Club, Edinburgh. Annual joint meeting with the East of Scotland Association. 3 p.m.

December 11. — INSTITUTE OF FUEL (YORKSHIRE SECTION): Sheffield. 'Some Aspects with regard to Treatment of Boiler Feedwater and Cooling Waters,' G. T. Peat. 2.30 p.m.

December 11.—COMBUSTION ENGINEERING ASSOCIATION (NORTHERN REGION): Metropole Hotel, Leeds. 'The Burning of Difficult Fuels,' by E. J. MacDonald, and 'Methods of Smoke Measurement and Control,' by G. Nonhebel. 10.30 a.m. and 2.30 p.m.

December 11. — INSTITUTE OF FUEL, NORTH WESTERN SECTION: Engineers' Club, Albert Square, Manchester. 'Gas Producers,' by Sinclair Gaskill. 2.30 p.m.

December 11.—LONDON AND SOUTHERN JUNIORS: Visit to Siebe, Gorman, Tolworth, Surrey, 2.30 p.m.

December 12.—INCORPORATED PLANT ENGINEERS (MERSEYSIDE AND N. WALES): Exchange Hotel, Liverpool. 'Heating and Ventilation,' discussion led by H. S. Crump.

December 12. — WALES AND MON. JUNIORS (SOUTH WALES AREA): Cardiff. Paper by member of staff of mechanical engineers department, Wales Gas Board.

December 12.—LONDON AND COUNTIES COKE SALES CIRCLE: Connaught Rooms, Great Queen Street, Kingsway, W.C.2. Christmas meeting. 2.30 p.m.

December 13.—SCOTTISH G.C.C.: 26 Drumsheugh Gardens, Edinburgh. 2.30 p.m.

December 17.—INSTITUTION OF CHEMICAL ENGINEERS (N.W. BRANCH): Manchester. 'Chemical Engineering Aspects of Gas-solid Reactions,' Prof. K. G. Denbigh. 7 p.m.

December 17.—INSTITUTION OF CIVIL ENGINEERS: Graham Clark Lecture. 'The Engineer and Management,' Sir Ewart Smith. 5.30 p.m.

December 20. — NORTHERN JUNIORS: Darlington. Short paper meeting for the 'A. C. Hovey' award. 2.15 p.m.

Personal

MR. F. A. TIMMINS has been appointed Station Engineer at the Bromley-by-Bow works of the North Thames Gas Board. He succeeds MR. R. G. PLUMMER, now Production Engineer with the Southern Board. Mr. Timmins has been at Bromley for the past eight years, latterly as Deputy Station Engineer. He has had 40 years' service in the industry.

MR. REGINALD FREDERICK HANKS has joined the Board of Parkinson & Cowan, Ltd. A Director of the British Motor Corporation and of the Nuffield Organisation, Mr. Hanks is also part-time Member and the Chairman of the Western Area Board of the British Transport Commission.

MR. JACK ROWE, who has retired after completing 43 years in the gas industry with the Yeovil Corporation and the South Western Gas Board, has been presented with a refrigerator and a chiming clock. Presentations were made by MR. J. D. BUTLER, Divisional Engineer and Manager.

U.K. Firm Wins Austrian Order

A £1¼-MILL. contract has been awarded to Constructors, John Brown Ltd., for the construction of a natural gas pipeline system in Lower Austria by Niogas, Niederosterreich Gasvertriebs, A.G., the Lower Austria organisation responsible for the distribution of gas fuel. The gas will be used mainly for industrial purposes.

The pipeline system will cover a total of 160 miles and CJB. will use the technical services of their American associates, Williams Bros. of Tulsa, Oklahoma. Austrian sub-contractors will carry out a considerable part of the work and Austrian labour and equipment will be used.

The pipeline will range from 12 in. to 6 in. in diameter with a high proportion of 12 in. and 10 in. sections. Gas, which will be cleaned and dried before being supplied, will flow through the pipeline at a maximum pressure of 900 lb. per sq. in.

New Factory for Plenty & Son Ltd.

PLENTY & SON have purchased a new factory site with existing buildings at Shaw, Berkshire, to which will be moved the manufacture of their smaller pumps, filters and Impelator mixing machines. This move has been necessitated by the steady increase in demand for their products.

Eagle Iron Works, Newbury, the present head office, will in future concentrate on large pumps and filters, as well as other heavy engineering products for the marine field.

Safe Driving and Long Service

Southern Board Awards 149

SAFE driving awards were presented to 149 Southern Gas Board transport drivers at Southampton's Palm Court ballroom by the Board's Chairman, Mr. C. Harold Leach, recently. Last year the Board's transport fleet did 5 mill. miles—the equivalent of ten journeys to the moon—he told them.

The Chairman commented that of 301 of the Board's drivers who entered the 1956 safe driving competition of the Royal Society for the Prevention of Accidents 234, or 77%, received awards—a first-class record.

The proceedings were opened by Mr. H. M. Lawrence, the Board's M.T.C. Manager, who welcomed the guests. Guests included Mr. C. G. Box, Chief Constable of Southampton, Councillor Freemantle, Chairman of the Accident Prevention Committee, and Mr. H. Jackson Seed, Entertainments and Publicity Manager.

'GAS SERVICE POCKET BOOK'

THE 1958 'Gas Service Pocket Book' is now being distributed. In addition to the usual technical data which has been brought thoroughly up to date, there have been added to the 1958 edition some 20 pages of up-to-the-minute information on all types of gas appliances now in actual production.

The prepublication demand has been as great as ever and only a few copies remain, so please let us have your order right away if you have not already sent it.

The price—as before—is 6s., and includes postage.

Reconstruction at Sunderland

WORK has begun at the Hendon gasworks, Sunderland, on a reconstruction scheme which will increase the output by 4 mill. cu.ft. of gas a day and make it one of the most modern works in the country.

The new works, planned for maximum economy and efficiency, will be equipped with carbonisation plant of similar type to that at the Howdon-on-Tyne works in the Tyneside Division. The scheme involves the closing of the 50-year-old Ayre's Quay works, and concentration of production at Hendon.

When reconstruction is completed in the winter of 1960-61, daily output will be 14 mill. cu.ft.

Mr. W. O. Kirkwood, Sunderland Divisional General Manager, said this week that a new main entrance had been installed at Hendon and demolition work had begun on one of the retort houses. The closing down of existing carbonisation plant would not seriously affect present works personnel; the new plant was designed to meet the increasing demand in Sunderland and the general grid areas.

Nine Drivers Win Recognition in N.E.

MR J. BAXENDALE, District Engineer and Manager of the Scarborough District of the York-Harrogate Group of the North Eastern Gas Board, presented safe driving awards for 1956 to nine employees in the gas showrooms, Westborough, Scarborough, recently.

They included Messrs. J. A. Mawman, J. W. Hargreaves, H. E. Banks, and W. S. Chambers who received a first bar to a 5-year medal. Mr. F. R. White was unable to attend owing to illness to receive his first-year bar to a 5-year medal. Messrs. A. Croft and S. H. Wilson received fourth diplomas, Mr. D. C. Walker received a second diploma, and Mr. H. A. Simpson a first year diploma.

Sc.G.B. Makes 17 Presentations

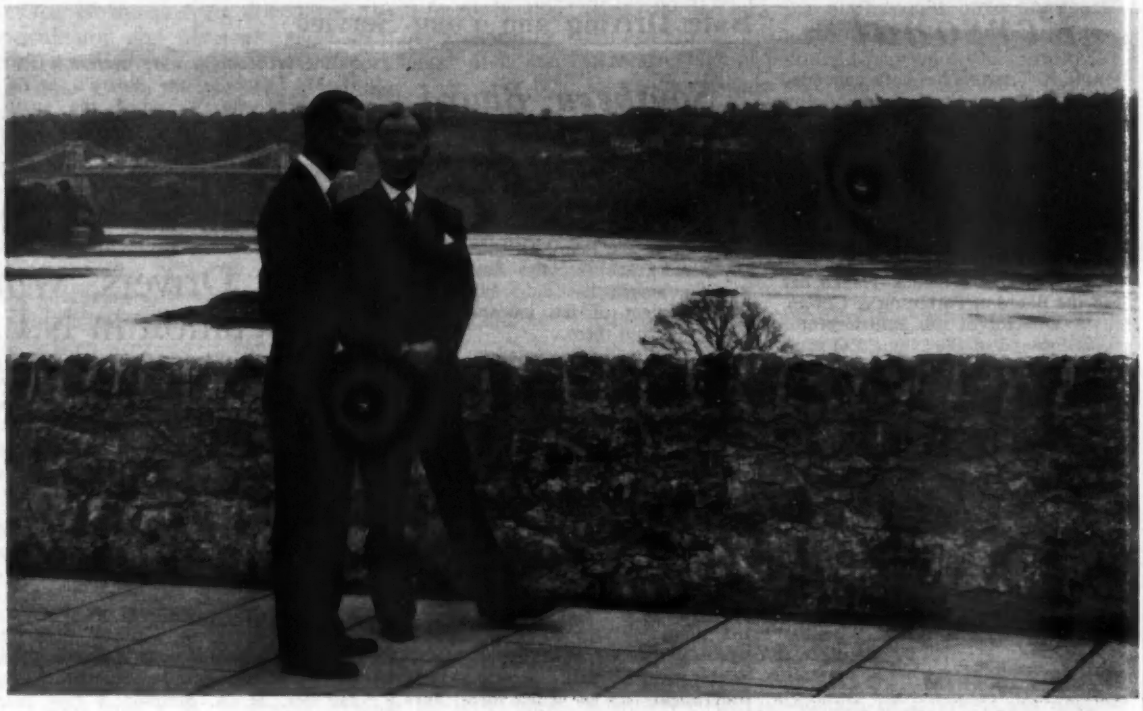
A bar to their 15-year safe driving medals was presented recently to Mr. W. Lyon and Mr. J. Page, of the Scottish Gas Board's Perth Group. A bar to their five-year medals went to Mr. A. Pirie and Mr. J. Halkerston, five-year medals to Mr. H. Angus and Mr. Robertson. Diplomas were awarded to Messrs. John Angus, Robert Campbell, James Cowper, Joseph Ford, Andrew Johnston, Thomas Livingston, Oswald Longden, John Macdonald, Alex. McQueen, William Martin, and Edward Robinson.

59 RECEIVE GIFTS FOR LONG SERVICE

THE Chairman of the Southern Gas Board, Mr. C. H. Leach, has presented long service awards to 59 employees in the Reading district. Among those who were recognised for 40 years' service were: Messrs. REGINALD BRINDLEY (Newbury), THOMAS CAMERON CORDEROY (Thatcham), RALPH AUDREY EARLEY (Earley), FREDERICK GEORGE GOODSON (Woodley), ROBERT WILLIAM ALBERT JACOBS (Reading), ALFRED LEONARD KEMP (Caversham), SIDNEY HERBERT MILES (Reading), HARRY WILLIAM LESTER (Reading), and LESLIE WILLIAM THORN (Newbury).

Woodall-Duckham Ltd.

The Directors of Woodall-Duckham, Ltd., has declared an interim Dividend of 5% (same) on a capital as increased in June of this year.



A Great Day for Bwrdd Nwy Cymru

THE Duke of Edinburgh, engaged in a strenuous three-day tour of North Wales, devoted two-thirds of Thursday, November 28, to inaugurating the North Wales gas grid, inspecting one source of its gas supply, and visiting an important manufactory whose siting near St. Asaph was only made possible by the initiative of the Wales Gas Board.

Prince Philip arrived just after 10 o'clock at Point of Ayr colliery, where he was met by Mr. T. Mervyn Jones, Chairman of the Board and spent 45 minutes inspecting the methane reforming plant.

From Point of Ayr the Duke drove to the Chance-Pilkington optical works at St. Asaph. The siting of this plant demanded the fulfilment of two conflicting requirements—a clean and dust-free atmosphere and a substantial gas supply. The works are situated in some of the loveliest countryside in Wales and close to the line of the grid.

The gas supply is used to fire a recently developed type of glass melting furnace. It is also used for the temperature control of the moulds, which are arranged on a rotary pneumatic press. This press operates automatically and produces ophthalmic glass blanks at high speed.

The production from the factory is controlled by using strict quality control methods. The laboratory is equipped with a modern gas furnace and ancillary equipment, to ensure that the raw materials are of high quality. To maintain the amenity of the rural surroundings, gas has also been used to heat the factory and offices and to provide domestic hot water and canteen facilities for the employees.

Later on it is understood that the factory will be turning out slabs of lead glass 4 ft. square and some 12 in. thick to function as inspection windows in nuclear power plants.

Meanwhile, a distinguished gathering including representatives of all branches of the gas industry, was taking lunch in H.M.S. Indefatigable, and later proceeding to a marquee erected on the roadside overlooking Cae Glan-y-Môr, a stretch of country presented to the National Trust in order to have preserved the magnificent view of the Menai Straits with the two famous bridges and the mountains of the Snowdonia National Park beyond.

Here had been built a commemorative table in Penmon limestone carrying inscriptions in Welsh and English and a couplet by Cynan; and punctually at 2 o'clock presentations were completed and His Royal Highness and the Chairman took their places by the table.

Commemorative Table

In welcoming the Duke and other visitors, the Chairman said: 'Wales today is honoured to welcome the Earl of Merioneth, and the Chancellor of its own, the People's, University. It is an earnest of their loyalty to their Queen and their admiration for Your Royal Highness, that there were so many more of the people of Wales, who wished to declare that loyalty today than could be accommodated in available time and space.

'Wales' own Gas Board, the authority alone responsible for Wales, and for Wales alone—for Wales is completely one, at least in the gas industry—are honoured to welcome, in Your Royal Highness, an Honorary Chartered Gas Engineer, who by act as by word has shown Royal recognition of the vital importance, of the problems (they are also the opportunities) of the power industries in Britain today—and not the least one of the oldest of all, the gas industry.

'The Board is proud, nay jealous, of its Wales national independence and authority. Equally is it sensible of its accountability to Her Majesty's Government and people—its father-in-law is the Ministry of Power, whose Sir John Maud we welcome today, as we thank him for his personal part in its achievement. No less, too, do we the Board recognise our wider responsibilities to Britain's gas industry and loyalty to the team that is the Gas Council, whose Chairman, Sir Harold Smith, with other fellow members join us in welcoming Your Royal Highness today.

'Of our own colleagues present we especially mention our Distribution Engineer, Mr. W. T. Hird, whose day of triumph this is. There are here also representatives of contractors and of those "out on the job."

'Finally, all those engaged in industry in any way in Britain today are honoured to welcome, and to listen to, Your Royal Highness, who with vision and purpose has shown so lively a concern in "Man at Work" and all that goes with it. We feel that the Conference on "The Human Problems of Industrial Communities in the Commonwealth and Empire" of which you personally were creator and sustainer, and to which you gave your name, was a milestone or indeed a rocket platform along the course that is the story of "Man at Work" and "Man in Community," and the perennial struggle the better to balance both.

'As in Canada recently, you reminded us, it is man that comes first, and his whole life. So it is the company here this afternoon seeks to reflect the variety of that life in Wales today. So for colleague Board Members, and in such company, we are indeed sensible of the honour it is to invite Your Royal Highness to inaugurate the North Wales gas grid.'

Great Day

Replying, the Duke said: 'This is a great day for the Wales Gas Board. It is a great day for the whole gas industry of this country. The Wales Gas Board has shown by its energy and initiative that a gas grid can be built both quickly, through most difficult country, and at a reasonable cost.

'It will always stand to the credit of the Board that they pioneered the rapid pipeline technique used in America and the Middle East. They did it in the face of the usual host of gloomy predictions that they would surely fail.

'Recent advances in gas-making methods have given a much needed face-lift to the gas industry as a whole. If anyone thinks of the gas industry, which was pioneered nearly 200 years ago, that there is no room for development, let them be convinced by this achievement that they were very wrong indeed.

'The grid will do much for the domestic and industrial consumers and the industrial suppliers. Above all it is breathing new life into the industry itself.

'Gas at present is usually made from coal which is Britain's only major source of indigenous power; and gas is the most efficient user of coal. It will still be worthwhile making gas from coal when it is not worth making anything else from it.

'I am convinced the gas industry is facing a great future and the possibility of great development. I do not think it is too much to hope that we shall see a national gas grid before very long.'

Mr. Mervyn Jones then introduced a recorded reading of the inscriptions on the commemorative table, and afterwards read a telegram which he had sent to Mr. John Hay Whitney, the American Ambassador, in which he referred to 'Britain's first high-pressure gas pipeline project constructed by the joint efforts of British and American companies and engineers.'

The Ambassador's reply was: 'Detained in London by American Thanksgiving observances. I deeply regret inability to attend inauguration of North Wales gas grid to observe at first hand successful culmination of this important project in which my countrymen have participated. Please accept my congratulations and best wishes. Cymru am byth' (Wales for ever).

A presentation was then made to the Duke to mark his visit. The gift was in the form of a fishing rod for himself and one for Prince Charles. The presentation was made by Terence Hough, 23 years of age, one of the Gas Board's fitters, who comes from Maesteg.

As an apprentice of the Board he attended the Sea School of the Outward Bound Trust at Aberdovey, and on this great occasion he wore the uniform of the school. He has just completed his national service.

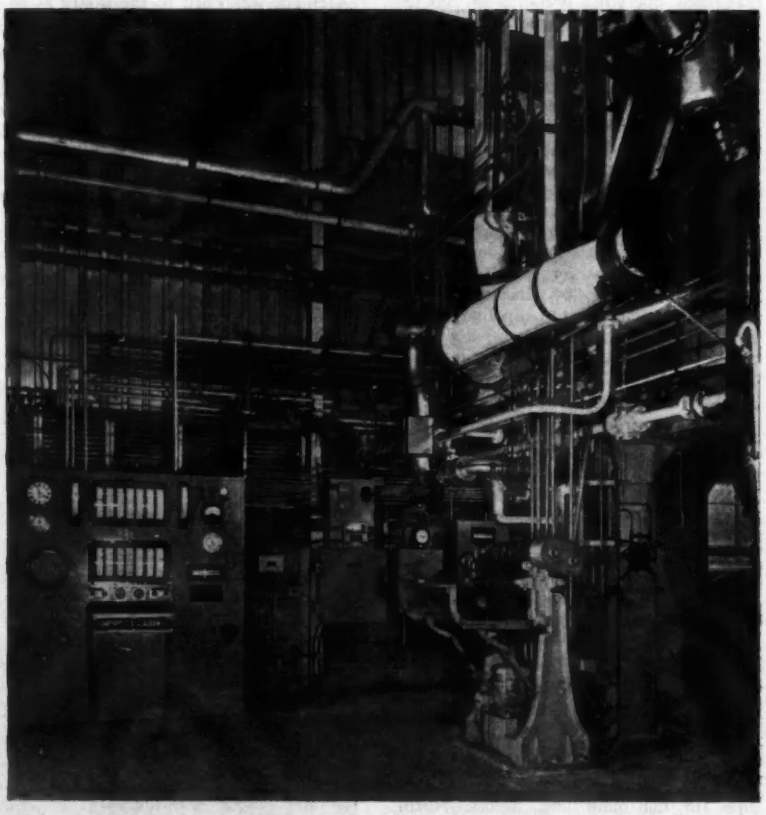
Presentations which completed the ceremony included Mr. W. R. Jones, who is 85 years of age, and has completed 70 years' service in the gas industry.

THE NORTH WALES PIPELINE

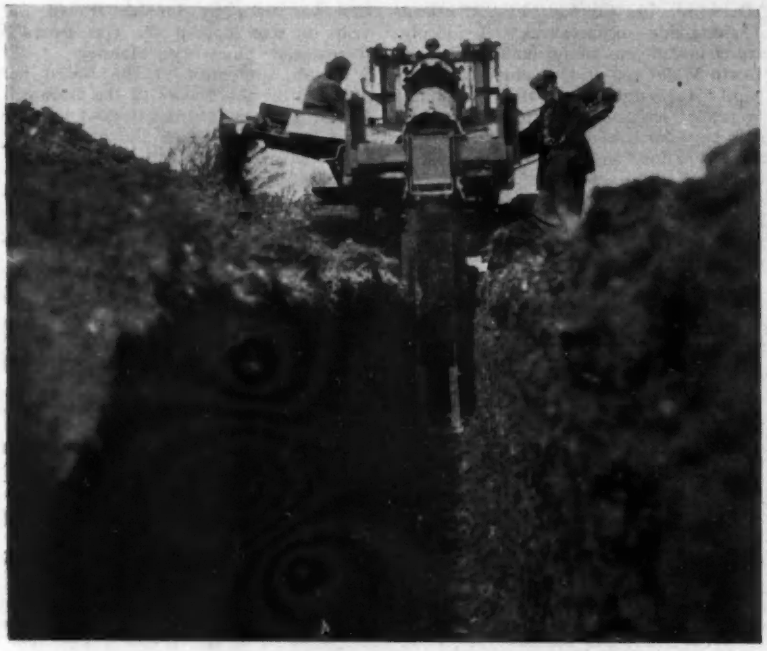
'Tough' by American Standards

THE North Wales grid, as now constructed, consists of 180 miles of high pressure pipeline ranging in size from 3 in. to 14 in. running from Llangollen through Wrexham to Connah's Quay and along the North Wales coast as far as Caernarvon, with a branch over the Menai Straits to Anglesey. Provision has been made for future extensions from Caernarvon to Nantlle Vale, from Llanrwst to Blaenau Ffestiniog, Portmadoc and Pwllheli, and from St. Asaph to Denbigh and Ruthin. Gas is at present supplied to 22 gas undertakings.

The grid, with the exception of the section from Wrexham to Cefn Mawr and Llangollen, is constructed of steel pipes with welded joints. The system of pipelines, although interconnected at the three compression stations, is designed in three different pressure sections. That from Wrexham to Rhos, Cefn Mawr and Llangollen is constructed with flexibly jointed spun iron pipes, and the maximum operating pressure is not expected to exceed 30 lb. per sq. in. The section from the Maelor works northwards to Mold, Buckley, Connah's Quay, Flint and Holywell is of welded steel pipe, and is designed for a maximum operating pressure of 75 lb. per sq. in. The main line westwards from the treatment and



Humphreys & Glasgow Onia-Gegi catalytic reforming plant at Point of Ayr, near Prestatyn. Our picture shows the cyclic control, instrument panel and piping, and part of the reactor.



Continuous trenching across country speeds up main laying operation.

compression station at Shotton is of welded steel tube and is designed for a maximum operating pressure of 200 lb. per sq. in., although the pressure at present necessary does not exceed 45 lb. per sq. in. The pressure capacity of the pipeline provides an ample reserve for future development in demand.

The distance over which the gas has to be transmitted is high in relation to the volume of gas handled. This has resulted in operating pressures higher than are traditional in the British gas industry. This same relationship between volume and distance has made it more economic to allow for future development in demand by increasing the pressure capacity of the pipeline rather than laying a line greater in size than that required in the early stages of development.

Essential Target Date

The scheme was authorised in December, 1953. It was essential to complete the link between Maelor works and Shotton and to construct the main pipeline across North Wales from Shotton to Caernarvon with branches to all the receiving undertakings, a total of 96 miles of pipeline, by January 1, 1956, the date the Board was due to take gas from John Summers and Sons, Ltd., at Shotton and the National Coal Board at Point of Ayr. Enough steel pipe could be obtained for the completion of the 14 miles remaining of the Maelor-Shotton section during the late autumn and winter of 1954. Delivery of the remaining 82 miles of pipe for the main line across North Wales could not commence before the late winter of 1954 and the spring of 1955. This left only the summer and autumn of 1955 for the actual pipeline construction.

A choice was open to the Board as to the method of construction. It could lay the pipe by traditional methods. The main disadvantage of this was that there was insufficient labour available locally to allow the main to be constructed in time. The alternative was to employ the pipelining techniques successfully developed in America and the Middle East. These had been studied by the Board's Distribution Engineer during a visit to America with an O.E.E.C. Mission in the spring of 1953. A number of contractors were approached, and Costain, John Brown Ltd. came forward determined to establish that these pipelining techniques could be successfully adopted in Britain. They worked in conjunction with their American associates, Williams Bros. of Oklahoma. Thus the construction of the pipeline, as the idea of which it was born, was an example of purposeful British-American co-operation.

Construction Broken Down

Pipelining has resulted from the application of process study to main-laying. The essential feature is that construction is broken down into a planned sequence of operations, each operation self-contained in men and plant. They are carried out in the sequence given along a 40 ft. cleared working strip. Each operation is equipped for equal daily progress. The aim of each unit is to catch the unit ahead and to keep ahead of the one behind.

A 40-ft. wide working strip is first cleared to allow passage of plant, machines and vehicles along the right-of way. Gaps are made through hedges and stone walls, sleeper bridges constructed across ditches, and trees cleared. The top soil is then removed, and a trench 3 ft. 6 in. to 4 ft. deep is dug ready for the pipeline, and individual lengths of steel pipe are placed along the right-of-way in readiness for the welding crews. A bending machine precedes the welding unit and bends any pipes as necessary to meet minor changes in the contour of the ground.

The crew leave behind them a long snake-like section of pipeline, shaped to 'fit the ditch,' on support blocks beside the trench. A machine travels along the pipeline, the front end of the machine cleaning the pipe with knives and wire brushes, the rear end applying a coat of primer. The pipeline is lifted off the support blocks ahead of the cleaning and priming machine by a side boom tractor. A second machine travels along the pipeline applying a hot coating material simultaneously with a reinforcement of fibreglass tissue and, where required, an outer wrap of kraft paper or impregnated felt.

Final Stages

The wrapped pipe is then inspected electrically to find any imperfections in the wrappings which are then repaired. The coated pipeline is lifted off the support blocks and placed in position at the bottom of the trench. Finally, the trench is filled in, hedges are replanted, stone walls rebuilt, and any other work necessary to restore the right-of-way to its original condition is carried out.

Before construction could begin it was necessary to survey the route and to obtain the necessary wayleaves. Part of the survey was done by helicopter. The results obtained proved that much time and labour could be saved in route selection, particularly in the hilly and mountainous sections. Consent had to be obtained from more than 300 owners to lay the main through their land and from almost the same number of tenants. Tribute must be paid to the help and understanding received by the Board from land-owners, tenants, county and local authorities, and many others.

Completed in 6 Months

Work on the main line commenced at Connah's Quay on March 14, 1955, and was completed in six months. Eighty-two miles of pipeline were constructed at an average rate of 3½ miles per week, with a maximum of over 5 miles in one week. It may here be added that the British crews trained in North Wales in 1955 constructed the Board's 66-mile Pembrokeshire pipeline in 1956 at an average rate of just under 4 miles per week, with a maximum of 6½ miles.

Much of the plant used was imported from America: Ditching machines capable of cutting 2 miles of trench each day; side boom tractors for handling the long snake-like sections of pipe welded together; bending machines; and the cleaning and priming, and coating and wrapping machines.

Men experienced in pipelining methods and the use of the machines were

brought from America to train British operatives and to supervise the work.

The route of the pipeline was in places what the Americans called 'tough.' It crossed three major rivers, the Dee, the Clwyd and the Conway. It crossed the Snowdon range between Tal-y-Cafn and Aber, 7 miles of rock and boulders interspersed with bog, where the line reaches a height of 1,750 ft. above sea-level. The line crossed 5 other rivers and 127 streams, 25 main roads and 153 minor ones, and was laid under 17 major and 10 minor railway crossings; 1,250 hedges and 124 stone walls were cleared from the right-of-way and later replaced.

Preservation of Countryside

Throughout the construction of the grid care was taken to preserve the beauty of the countryside and its fine buildings. Now it is in the ground the only visible signs of the pipeline are the special marker posts placed at intervals along the route. The method used to attach the pipeline to the Menai Suspension Bridge is an illustration of the care taken. The 560 ft. centre span presented no problem. With the assistance of the permanent painting trolley which travels beneath the span, the pipeline was laid between the steelwork underneath the roadway. The problem was how to lay the main from the mainland at either side to the centre span without disfiguring the bridge or interfering with its use. A number of plans were discussed with the Ministry of Transport, the Royal Fine Arts Commission and other interested bodies. It was decided to increase the depth of a corbel on the outside stonework of the bridge above the arches by the addition of an L-shaped section of matching stone. The pipeline was laid inside the section which was then filled with bitumen and concrete.

Gas from the coke ovens at Shotton was pumped into the pipeline on November 13, 1955, six weeks ahead of the deadline.

In the summers of 1956 and 1957 the Board constructed by direct labour, using

Pipe being bent in situ to fit the contours of the ground by the portable tractor-operated bending machine.

similar methods but much reduced in scale, extensions of the pipeline across Anglesey to Llangefni, Amlwch and Holyhead, and to Llanrwst and Llanberis. The average rate of progress has been 1 mile per week with a maximum of 2 miles.

Responsible to the Board for the design and construction of the pipeline was W. T. Hird, M.INST.GAS E., Distribution Engineer.

The pipeline is inspected monthly, particular attention being paid to river crossings.

It is protected externally with a coating of coal tar enamel, reinforced with fibreglass tissue. This is supplemented by the application of cathodic protection, an electrical method of protecting the pipeline from corrosion using impressed electrical currents through graphite ground beds placed at intervals along the route. The slight flow of current from the ground bed to the pipeline prevents corrosion of the sheathed pipe. As a temporary measure, sacrificial anodes have been used to protect the pipeline under the river beds, until the impressed current system is in use.

With the exception of the first few miles from the main compressor station, the pipeline is laid without the traditional grading and syphons, following the contours of the ground with the drainage points only in valleys.

Gasholders at receiving stations will, in due course, be automatic. The control of the rate of flow to each station and of the measurement of the quantity supplied is by means of a combined Kent rate-of-flow and measurement unit operated by compressed air. Consideration is being given to the use of short-wave radio for remote telemetering and control.

Demands Increasing

The gas grid was constructed to meet the demands of all undertakings linked to it, with a reserve for the future. These demands are increasing. The grid makes possible the meeting of new demands not only in towns linked to it, but also along its route where no gas supply was previously available. The Chance-Pilkington optical factory is one example of industry being attracted to the area by the availability of grid gas. It is more than possible that this is the first of many comparable projects of industrial developments, particularly in North-West Wales, calling for a major gas supply. It is partly in anticipation of such demands that the North Wales gas grid has been constructed.

Mr. Mervyn Jones, Chairman of the Wales Gas Board, third from the right, watches the down welding process during the construction of the North Wales gas grid.

LONG-STANDING DISPUTE ENDS

Argentine to Settle Claims of Primitiva Gas Company

THE Primitiva Gas Company announces that a Decree has been issued by the Argentine Government authorising the conclusion of an agreement with the Company to settle its long outstanding claim.

Briefly, the terms are that the Argentine Government will pay to the Company a lump sum of £2,060,950 sterling in London in ten instalments over four and a half years, without interest.

This figure has been arrived at on the basis that the claim of the Municipality of the City of Buenos Aires against the Company is settled out of that Company's monies already under embargo. Each side is to pay its own costs in the expropriation suit.

Numerous outstanding questions, some involving considerable sums of money, remain to be settled before a final estimate of the probable return to Holding stockholders can be made.

The Board of Primitiva pay tribute to the Government of General Aramburu for the friendly manner in which the discussions leading to this settlement have been conducted.

Joint Meeting

WOLVERHAMPTON ENGINEERS AND MIDLAND JUNIORS

THE Midland Junior Gas Association, which recently visited the Banbury works of the Northern Aluminium Co., Ltd., last month held a joint meeting with Wolverhampton and District Engineering Society in the demonstration room at the gas offices, Wolverhampton. Over 80 members of both organisations were present.

Mr. H. B. Hartland, the President of the Engineering Society, took the Chair at the opening but, after introducing Mr. D. J. O. Bath, President of the Midland Juniors, invited him to take over. Mr. Bath mentioned, on accepting, that he was a member some years ago of the Society.

Mr. Bath informed the meeting that Mr. B. G. H. Hawkings, Distribution Engineer, No. 5 Division, W.M.G.B., had been awarded the Milbourne Prize for the previous session and called on Mr. H. B. Hartland to make the presentation.

Mr. F. E. Varlow was then introduced and presented his paper, 'Development and Use of the Lubricated Taper Plug Valve,' which was followed by a discussion.

A vote of thanks was proposed by Mr. G. W. F. Cockayne, Senior Vice President, Midland Juniors, and seconded by Mr. W. Grocott of the Engineering Society.

Further Smoke Control areas are announced

LOCAL authorities, which have had their smoke control orders confirmed include: Bolton County Borough, 58 acres, 320 premises (extension of town centre smokeless zone); Denton Urban District, 43 acres, 364 premises (new housing estate); Hayes and Harlington Urban District No. 1, 240 acres, 26 premises (mainly open space); Liverpool County Borough, 109 acres, 1,920 premises (city centre); Ossett Borough, 14 acres, 190 premises (new housing estate); and West Bromwich County Borough, 25 acres, 250 premises (town centre).

Meanwhile, Leeds Corporation Health Committee have decided in principle to recommend that the Ireland Wood area of 600 acres and the Butcher Hill area of 50 acres be made the first smoke control areas in the city. But they are to obtain the observations of the Housing Committee before seeking Ministerial approval.

One small smokeless zone—the Corporation estate in Roman Avenue, Roundhay—has existed in Leeds for some time. Virtually the whole of the two proposed new smoke control areas are also Corporation estates.

Clean Air Council for Scotland

The constitution of the Clean Air Council in Scotland was announced last month by the Secretary of State for Scotland. The Chairman is Sir David Anderson, Director of the Royal College of Science and Technology, Glasgow. Included among the Members are Mr. John Innes, Deputy Chairman of the National Smoke Abatement Society and President of its Scottish Division, and Mr. Thomas Ashford, Senior Smoke Inspector, Glasgow.

W.H.O. and Air Pollution

Twenty-one European countries were represented at a recent World Health Organisation conference in Milan to consider air pollution. The aim of the conference was to pool the knowledge and experience of many countries in this field. Air pollution was recognised as the greatest and most urgent environmental evil facing Europeans.

SALES INCREASE IN SPITE OF MILD WINTER

Colonial Gas Holdings Ltd.

NET profit for the year ended June 30, 1957, of Colonial Gas Holdings, Ltd., of Melbourne, was £174,579. Interim dividends of 3% on Preferred stock and 4% on Ordinary stock, paid on April 18, amounted to £84,000, while final dividends declared are also 3% on Preferred stock and 4% on Ordinary stock. Carry forward is £33,440.

Notwithstanding an abnormally mild winter in Melbourne, the total sales of gas increased by 2.3% as compared with 1956, while chemical and by-product undertakings had another satisfactory year.

With the exception of the sale of the Dandenong and Frankston areas to the Gas and Fuel Corporation of Victoria in April, the accounts are not materially affected by any abnormal circumstances.

Open forum held at Manchester Junior Meeting

MANCHESTER District Junior Association of Gas Engineers met in Radiant House, Liverpool, last month for an open forum in which any member who wished fired questions at a panel of experts.

The panel consisted of Mr. J. K. Lord, President of the Association; Mr. J. W. Rodgers, Sales and Service Officer, North Western Gas Board; Mr. H. Teasdale, Education Officer; Mr. K. Summersgill, Deputy Area Distribution Engineer; Mr. L. G. Townsend, Chemical Engineer; Mr. J. Hepworth, Assistant Engineer; Mr. H. B. Gidlow, Station Engineer; and Mr. T. W. Pickthall, Association Secretary.

WESTERN JUNIORS SEE NEW PLANT AT GLOUCESTER

OVER 70 members gathered at Gloucester gasworks recently to see the experimental work being undertaken in new methods of gasification. The Hall plant, Jones plant, G.I. plant, and Koppers Hasche plant were inspected.

After the tour, members heard a paper, 'Carbonisation on a Base Load Works,' presented by Mr. A. G. Yeaman of Bristol. The paper dealt with the development of Stapleton Road works into a base load works supplying gas into the integration grid network.

Mr. W. E. Baggs, Senior Vice President, presided, and Mr. C. R. Ingham, in charge of the work at Gloucester, opened the discussion.

Getting Going on Work Study — 1

Interest in the application of Work Study in the gas industry has been stimulated by the address recently given to the East Midlands Gas Board annual conference by Mr. R. M. Currie, C.B.E., Head of the Central Work Study Department of I.C.I. In this article — the first of a series of three specially written for 'GAS JOURNAL'—the writer discusses the problem of co-ordinating and stimulating Work Study activity in a large industry, and makes the suggestion that a central body should be formed in the gas industry for this purpose.

THERE is no need for me to describe what Work Study is; for those who are not quite sure there is a series of booklets entitled 'Outline of Work Study,' published by the British Institute of Management, in which the British attitude towards these productivity techniques is outlined. It is indeed a peculiarly British attitude. In other countries, time study and work simplification have developed along separate lines, with the result that many useful potentialities have been lost, as it were, between the two stools. Furthermore, the implications of these techniques in terms of human relationships and of negotiations with trades unions have been better studied in Britain than elsewhere. British Work Study is indeed a comprehensive concept, which is not concerned simply with refinements at shop floor level, but is applicable at the highest level.

When I mention that recently, at a cost of £750 and only a month's work, a small Work Study team managed to cut by half the cost of a £500,000 plant, it will be appreciated that we are after bigger game than many of the critics of Works Study imagine. Capital savings of this kind should surely make a strong appeal to a nationalised industry which—almost by definition—is chronically short of money; and there is no doubt that higher productive efficiency in the private firms providing goods and services to the gas undertaking would contribute substantially to helping the gas boards cut their coats according to the cloth provided by the Ministry.

Gas Board Pioneers

When Messrs. H. B. Bassett and W. J. G. Bryce presented their paper 'The Application of Work Study in the West Midlands' to the 94th annual general meeting of the I.G.E. last May, a keen discussion followed. From this one learned:

That the South Eastern Board felt the shortage of trained men, but had nevertheless gone ahead, especially in organising the work of maintenance craftsmen on the basis of planned and preventive maintenance.

That the North Thames Board had begun tentatively to consider replacing old-type incentive schemes with those based on proper Work Study.

That several boards had appointed Work Study Officers.

That there was a demand for 'a definite national policy' including responsibility for training and co-ordination of effort and exchange of information.

Worth quoting in full are passages from the comments of Mr. S. C. Herbert (South Eastern), which illustrate the extent to which a typical board has entered the Work Study field:

'In one of the plants of my Board we recently introduced Work Study techniques to guide the maintenance engineer in planning his work before a particular major overhaul was started. The department followed the job right through, in close touch with the foreman of all trades, and the final result, compared with the previous overhaul, which was only observed to gain information, showed a reduction of "down"-time of 30%. There was a more uniform level of employment right through the repair, a considerable reduction in waiting time between jobs, because the men knew individually beforehand the sequence of work they were to tackle, and the cost of the job remained about the same in spite of increases in wage rates over the intervening three-year period, and for a somewhat greater quantity of work done. Furthermore, there were at no time during the course of the work any 'panic' rushes to get work done which had been overlooked.

'In another of our works Method Study reduced locomotive working time by 50% and made redundant a number of railtanks. In a case of the loading of naphthalene into ships, about half the number of men are now employed for half the original time and two lorries and one crane have been dispensed with. Painting and scaffolding work is carried out at two of our works on a full-time basis and these jobs are the only ones which are run continuously so far on a work studied incentive bonus scheme. One outstanding result of the scheme has been the decrease in overtime working necessary from 80-90 hours a week to 100 hours in 15-16 months, but occasions do arise when local conditions will not permit the full realisation of economies offered by Work Study, and we have several schemes in being which have been shelved for the time being.'

There has in fact been considerable progress in the gas industry at local level in applying Work Study. However, listening to Mr. R. M. Currie at Skegness there was the feeling that other concerns—and especially those reputed wasters of public money, the Armed Services—had got going on Work Study in a big way; and it was apparent that the main reason for this was that some central organisation and stimulus had been provided. In the Air Force there is a Directorate of Work Study under an Air Vice-Marshal, which has not only co-ordinated a number of unrelated activities that were already going on, but has promoted the use of Work Study in jobs as widely diverse as the refuelling of Hunter aircraft and reception of an airman at a new station. The British Transport Commission have set up a central body, and have opened their first training school at Watford; here, as part of the training course, students actually get to grips with technical problems that arise in connection with the big railways development schemes. This leads naturally to what is perhaps a tactless question: Can the Gas Council set up a central Work Study organisation similar for example to the one in I.C.I.?

One Man and a Boy

In 1948 a very small staff ('one man and a boy' is the proverbial description of it) began to develop the central organ of Work Study in this vast group of companies with over a hundred thousand employees and getting off for a score of different divisions comparable with the gas boards. In 1957 I.C.I.'s record in Work Study is well known, and a head office department of 60 people helps to train and guide a total Work Study force of 1,400 in Great Britain alone. I.C.I. as a concern correlates the

activities of a large number of companies with different traditions making a very wide range of products from zip-fasteners to fertilisers. Obviously, getting going on Work Study in a company of this character has required the exercise of tact and imagination as well as a great deal of technical research and development.

How It Could Work

The gas industry is perhaps more fortunate than I.C.I. in its structure since, within limits, the boards are all doing very much the same range of jobs and have a very similar type of organisations. However, when I discussed this matter with an experienced student of gas board affairs he pointed out that there was no central organisation comparable with the central organisation of I.C.I.—'no real central discipline and authority' was the way he put it.

Nothing could be further from reality. I am told that the Central Work Study Department is functional. It does not exercise line authority but regards itself as the servant of management; and at divisional and works level throughout the company the Work Study people are in the same position—they are answerable to the line management. Another important point is that Work Study by fiat from head office has about as much chance of working as a celluloid dog has of surviving the fires of hell. I could put the problem in perspective by quoting a remark made by Mr. J. W. Holdaway (Eastern Gas Board, Watford Division) at the recent London meeting.

'Will there be any interchange of information between the Work Study teams of the various boards?' he asked. 'Although there will be variations from job to job, there will be many basic facts and data common to a number of jobs, and if this information is pooled much valuable time and money can be saved. In addition, the experience of each team in carrying out these studies will be most useful to the teams of other boards.'.

Making the experience of each available to all is essentially a functional duty, and appears to be well within the scope of the Gas Council. To name but one of the advantages of central co-ordination in this matter, let me mention what is called standard data—details about times and methods which may be developed by the Work Study men in one board, tested in practice and established as practicable. The value of such information to the gas industry at large is obvious; on the one hand it saves duplication of effort in Work Study, and on the other it avoids invidious comparisons between the practice of one board and another.

Finding the Men

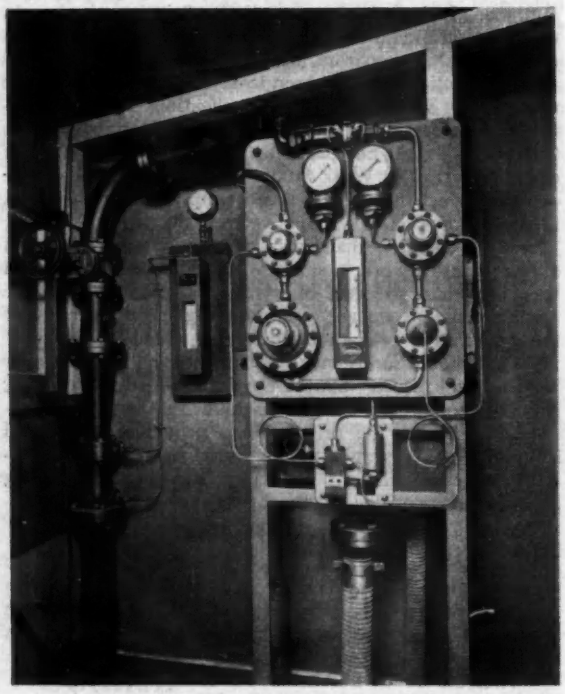
However, this is not in all probability the most important function that could be discharged by a central body set up by the Gas Council. The biggest problem of all in Work Study, as Mr. Holdaway has pointed out forcibly, is finding the men to do it. It is true that consultants may be brought in, and many industries have been brought to an appreciation of what Work Study can do by using outside consultants on limited projects. But by far the better method is to choose young men with a restless curiosity about, and even discontent with, the present way of doing things—young men who are technically trained to the gas industry—and to give them two or three months full-time training to be followed by intensive practical experience.

The British Institute of Management recently listed over 30 universities, technical colleges, trade associations and other organisations offering training in Work Study; some of these are better than others, but there are long queues for the best of them. Anyhow, since Work Study training must, as the saying is, 'smell of hot oil' there is really no substitute for organised facilities run within the industry. The experience of all large concerns who have adopted a dynamic Work Study policy confirms this.

One more point. One of the most important activities when a Work Study drive is being conducted is to see that management at all levels is given an appreciation of what it is and what it can do. Appreciation courses are surely better run on as it were 'neutral' ground than in the field. Indeed, if the Work Study training is linked with management development training at junior level great benefits can accrue. It has been proved over and over again that both the specialist and the line manager benefit from training of this kind at the outset of their careers.

(The remaining two articles, to be published on December 11 and 18, respectively, deal with the benefits that Work Study offers to management and employees respectively, and discuss problems likely to arise at these levels.)

Treating Effluents with Chlorine

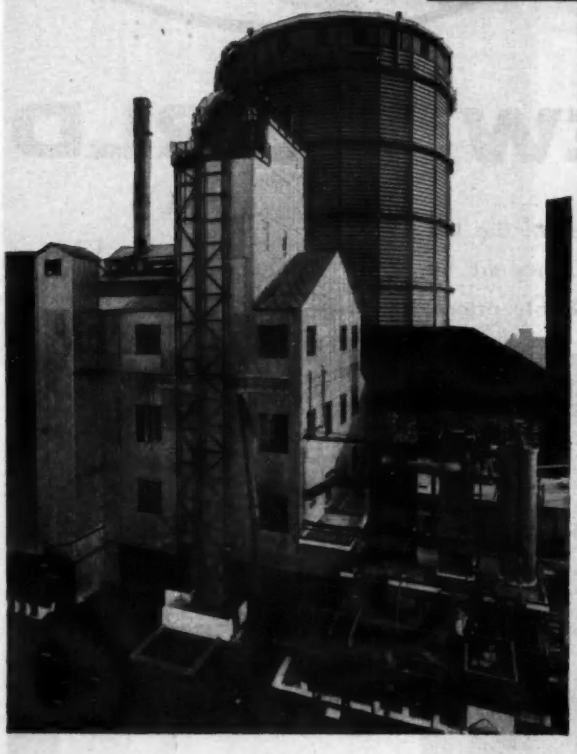


A METHOD of treating trade effluents with chlorine has been developed by the Paterson Engineering Co., Ltd. Chloronomes have been installed to purify gaseous effluents from factories and processes which result in noxious smells. Many industries discharge gaseous effluents into the atmosphere; some of these cause nuisances to the local residents, and very often chlorine is successful in reducing or eliminating this.

The equipment necessary for the control and administration of chlorine includes apparatus for the measurement of quite small quantities of chlorine gas (and other chlorine reagents, such as sodium hypochlorite and bleaching powder) as well as large capacity chloronomes which can be calibrated to give direct readings in pounds or kilogrammes per hour or day and can be fitted with any required form of automatic control. The effluents, for example, from certain manufacturing processes, particularly those handling organic materials, are often very foul or become foul after delivery into the local authority's sewers. In certain cases the sewage authority may refuse to accept effluents which might cause rapid putrefaction. Chloronomes can be installed to add chlorine to such effluents before they reach the sewers, thus preventing the onset of putrefaction and removing the objection to the delivery of works effluents into the sewers.

Further information may be obtained from the manufacturers at Windsor House, Kingsway, London, W.C.2.

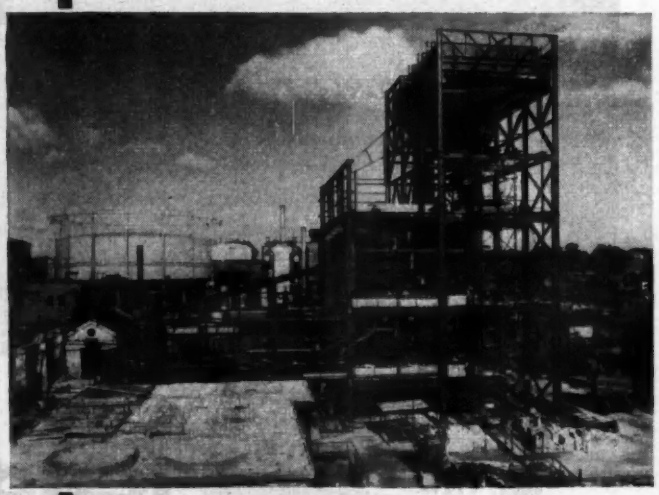
COMPLETE GASIFICATION



W-D/I.F.E. Complete Gasification Plants incorporating the Gas Integrale System.

The Kensal Green Works of the North Thames Gas Board. This plant was put to work in 1956 and is producing more than 2½ million cubic feet of 500 B.Th. U. gas daily.

The Gloucester Works of the South Western Gas Board. Now under construction, this plant will have a gasmaking capacity of 2½ million cubic feet of 470 B.Th.U. gas daily.



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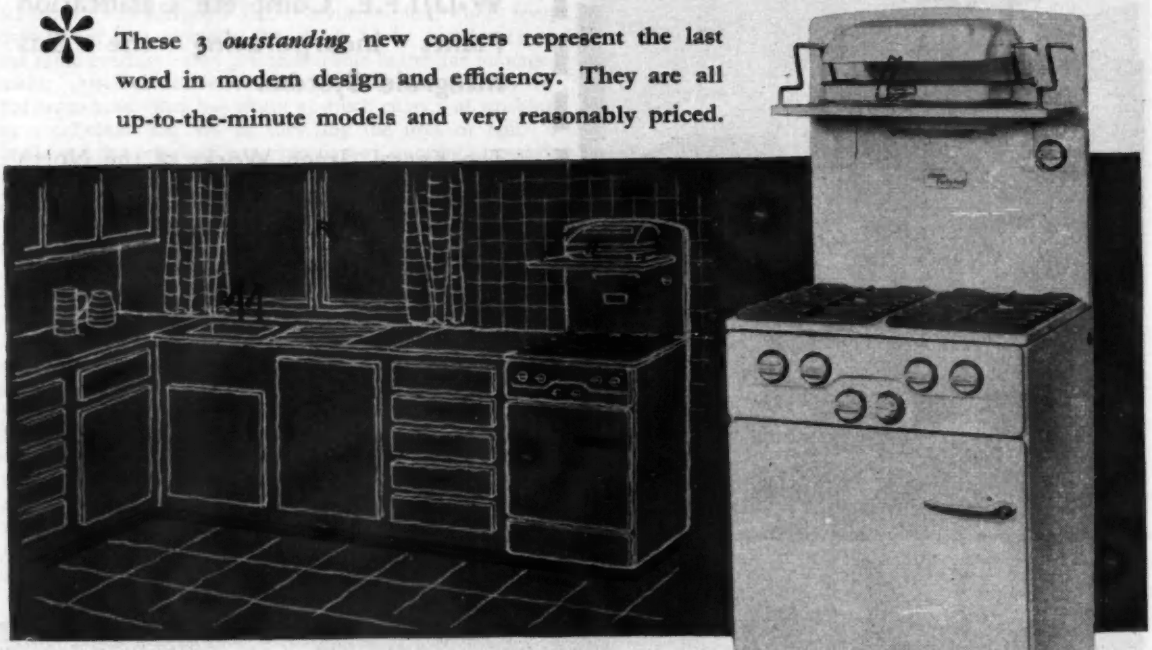

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An outstanding advance in styling, development, and performance. Four Radoflex boiling burners with Safety Taps giving an unusually flexible control of burner heat. Eye-Level Grill combined with Plate rack. Hotplate with large, smooth, spillage collection bowls. Wide, Regulo-controlled oven with easy-clean interior and Storage Drawer below. Mounted on recessed plinth base. Fits flush to the wall.

Colours—White or Cream.
Overall Height 55¼"
Width 21¼" Depth 22½"

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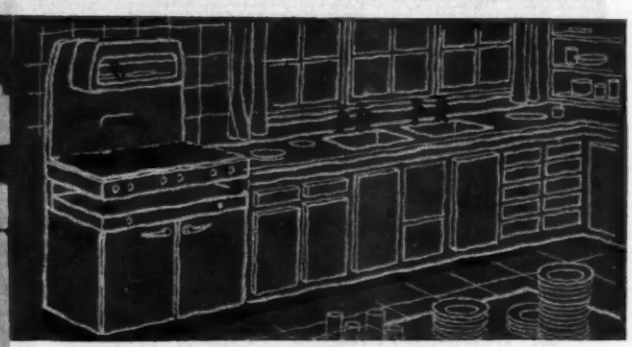
Colours — White or Cream.

Overall Height 47" Width 32½" Depth 22½"

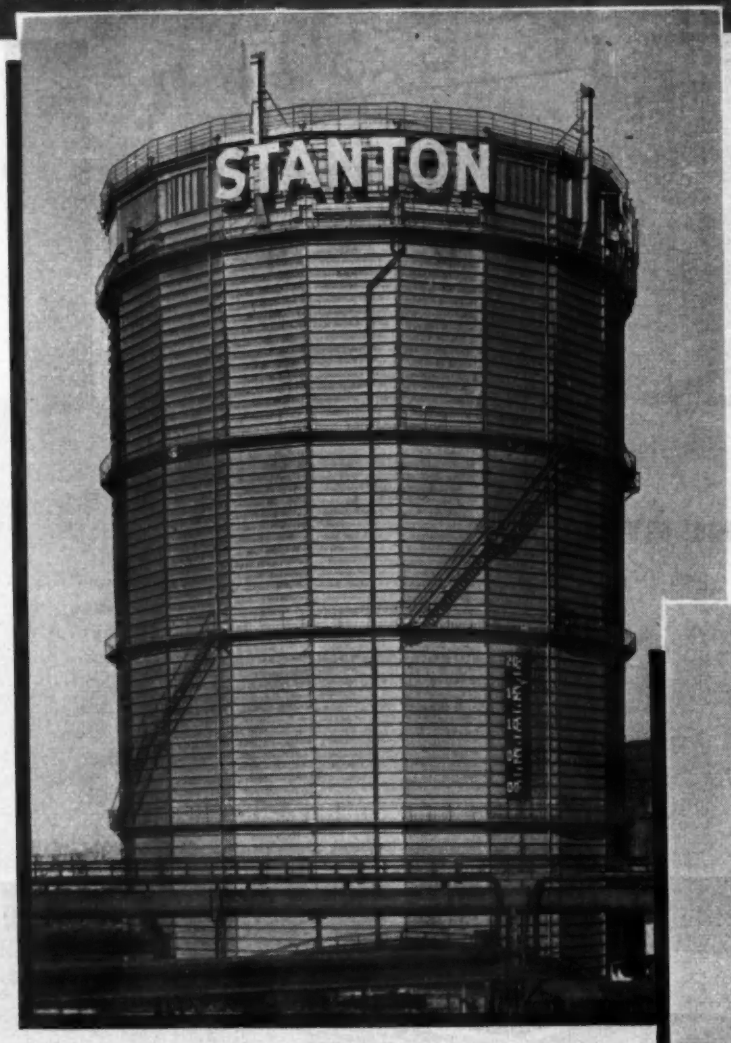


NEW WORLD NINETY

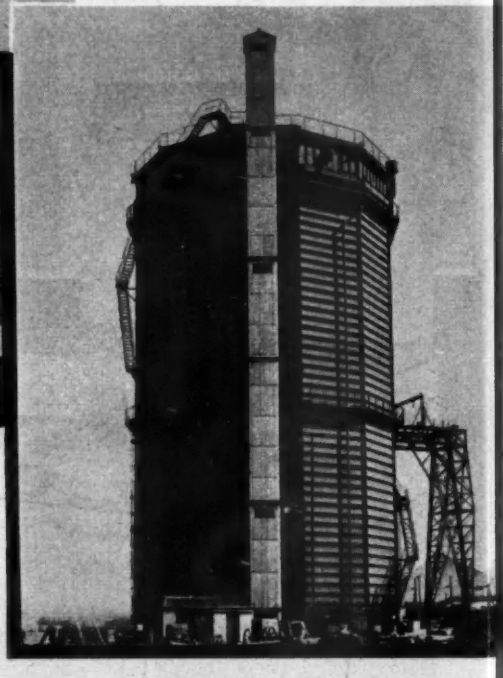
A robust, large-capacity cooker intended primarily for small hotels, cafes and boarding houses. Also suited for domestic purposes in the larger household. Comprises a large Regulo-controlled oven with double doors, a spacious but simply designed hotplate incorporating six Radoflex boiling burners with safety taps and a dual Eye-Level Grill. Fits close to the wall.

Colours — White or Cream. Overall Height 61" Width 30½" Depth 28"

GASHOLDERS



OF ALL TYPES *and* FOR ALL PURPOSES



M.A.N. Waterless Gasholders of 2 mill. cu.ft. and ½ mill. cu.ft. capacity recently erected by us, for the storage of blast furnace and coke oven gas respect vely. (Photographs by courtesy of the Stanton Ironworks Co. Ltd.)

DE
DEMPSTER · ELLAND

ROBERT DEMPSTER & SONS LTD.
ELLAND, YORKS

And in that heaven of all their wish There shall be no gas mains, say fish

AFTER RUPERT BROOKE

THE laying of a gas main across a river 3 ft. deep and 68 ft. wide may sound simple. But it is not so simple if the river happens to be a world-famous trout stream and the lower reaches abound in salmon, too!

Southern Gas Board men were faced with this problem when they reached the River Test, in Hampshire, during the course of laying a 16-in. main from Southampton to Salisbury.

Trenching the river bed would have caused an international furore among fishermen—not to mention the fish. A bridge would have been no better. Thrust-boring solved the problem.

A bore-pit, 42 ft. long, 10 ft. wide and 28 ft. deep was driven into the squelchy mud beside the river. Then an auger, housed in a 20-in. steel cover pipe, ate its way 5 ft. below the river-bed, throwing mud back along the pipe.

A 16-in. main was then introduced into the sleeve pipe and bonded. The job was done.

Ship Coke from Scarborough? — Oh no! no! no!

SCARBOROUGH Chamber of Trade and Commerce at its November meeting expressed 'grave concern' regarding the scheme for shipping coke from Scarborough harbour during the summer, and it was resolved that steps should be taken to acquaint the Harbour Committee with the chamber's views.

The meeting felt that the amenities on which Scarborough depended for its position as the leading holiday town of the North would be seriously affected by the coke loading. A member asked whether the effect of a procession of coke wagons moving down the valley and along the foreshore in the summer season had been fully appreciated.

The Harbourmaster stated that in the year when the first coke shipment was taken from Scarborough shipments would would not be made during July and August so that the working of the harbour, particularly by the herring fleet, would not be interfered with.

The Gaslight Lingers On

Yeovil Town Council have been told that gas lamps in the town are not likely to be replaced by electric lamps before next spring.

'KEEP THAT HOLDER FROM GOING UP'

RICHMOND (Surrey) Borough Council is making last-minute efforts to stop the North Thames Gas Board building a new 3½ mill. cu.ft. gasholder at its North Sheen works. Building is due to start early next year.

At the Council's November meeting, Alderman E. W. Wilton, Chairman of the Town Planning Committee, said that Sir C. S. Harvie Watt, M.P. for Richmond and Barnes, had been asked to make representations to the Minister of Fuel and Power and, if necessary, in Parliament. He also asked organisations in the town to support the Council's objections.

Alderman Wilton said it was a serious matter for a town so well known for its beauty. They had been treated with every courtesy by the Board, but the situation remained the same. For the Board to have power to build a gasholder where it wished made nonsense of town planning.

Councillor D. Maddock said: 'Here we have a case where a public board, by exercising a purely arbitrary authority arising from an Act of Parliament passed many years ago, has succeeded in imposing its wishes against the unanimous wish of the elected members of this Council.'

It was most lamentable and an example of what they could expect from the nationalised industries.

A Case of Coals to Newcastle

THE North Eastern Gas Board used 54,700 tons of United States coal during the year, Dr. R. S. Edwards, Board Chairman, stated at a recent meeting of the Gas Consultative Council in Leeds. He agreed that since a large part of the area covered by the Board was over the Yorkshire coalfields it would appear to be a case of carrying coals to Newcastle.

Dr. Edwards, who was commenting, at the invitation of Alderman H. Sutcliffe, Chairman of the Council, on the annual report, said that the highlights were a mixed bag of good and bad. Gas sales were down, coke and breeze sales were up, and coke exports were a record.

Alderman Sutcliffe congratulated Dr. Edwards on the Board's results and thanked him on behalf of the Consultative Council for his comments on the report.

Alderman Whitaker (Todmorden) also congratulated the Board, but referring to the ever increasing price of gas, described the Board's profits as 'plunder.'

Mr. A. L. Mollett (Bradford) jumped to his feet to object. 'Profit is not plunder,' he said. 'And it will be a sad day for the gas industry when they don't make a profit.'

EAST ANGLIAN TOWNS GET THE FIRST OIL GAS SUPPLY

TWO historic towns in East Anglia have become the first in Britain to have a gas supply entirely produced from oil, instead of coal. They are Thetford, Norfolk, whose population of 4,447 will be more than doubled under a London County Council 'overspill' plan, and Brandon, Suffolk, six miles away.

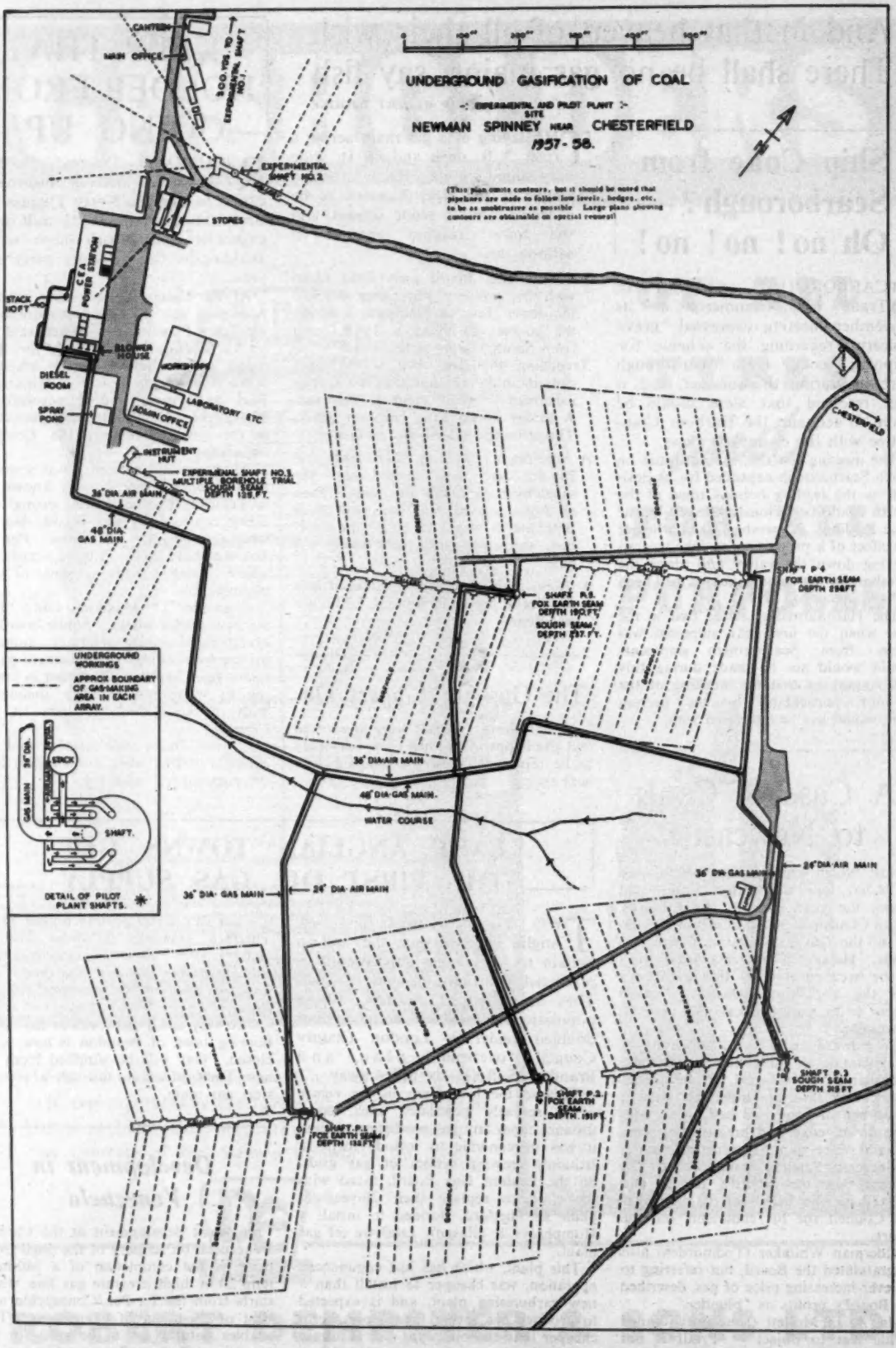
Because the towns are in the centre of a sparsely populated area, some distance from any gas producing station, it was uneconomic to include them in Britain's growing system of gas grids. So the Eastern Gas Board, faced with the need to replace their 26-year-old plant at Thetford, decided to install a Humphreys & Glasgow catalytic oil gas plant.

This plant, which has just commenced operation, was cheaper to install than a new carbonising plant, and is expected to produce gas several pence per therm cheaper than the old plant did. Entirely automatic, it can be controlled by a single man. The plant is in two units, each with a capacity of 300,000 cu.ft. of gas per day. The present output of the Thetford gasworks is about 45 mill. cu.ft. a year. Since demand is almost entirely during the day, the output can now be achieved by operating for two shifts.

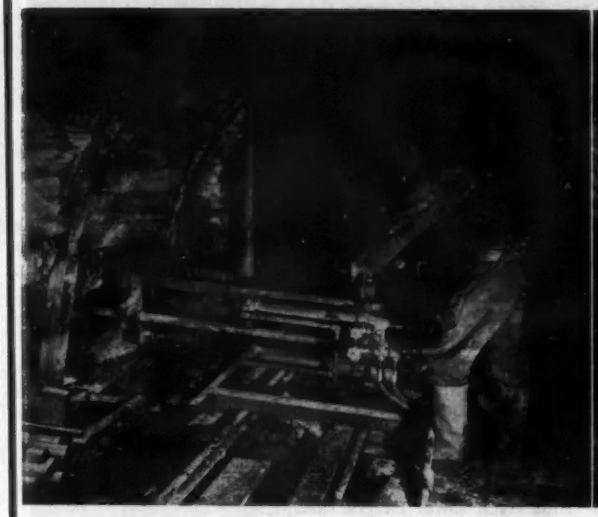
The very small gasworks in the neighbouring town of Brandon is now to be closed. Gas will be supplied from the new Thetford plant, through a six-mile steel gas main.

Development in Venezuela

A recent development at the Cardón, Venezuela, oil refinery of the Shell Company, is the completion of a 180-mile-long 20-in. high pressure gas line, which starts from the La Paz/Concepción area west of the town of Maracaibo. This enables natural gas to be used for the operation of the refinery, replacing the liquid fuel previously used for this purpose and making it available for sale.


UNDERGROUND GASIFICATION OF COAL
-: EXPERIMENTAL AND PILOT PLANT :-
SITE
NEWMAN SPINNEY NEAR CHESTERFIELD
1957-58.
(This plan omits contours, but it should be noted that pipelines are made to follow low levels, hedges, etc, to be as unobtrusive as possible. Large plans showing contours are obtainable on special request)
CANTEEN
MAIN OFFICE
EXPERIMENTAL SHAFT NO.2
STORES
C.E.A. POWER STATION
STACK 100FT
BLOWER HOUSE
DIESEL ROOM
WORKSHOPS
LABORATORY ETC
ADMIN OFFICE
SPRAY POND
INSTRUMENT HUT
EXPERIMENTAL SHAFT NO.3 MULTIPLE BOREHOLE TRIAL SOUGH SEAM DEPTH 138 FT.
36" DIA. AIR MAIN
48" DIA. GAS MAIN.
TO CHESTERFIELD
SHAFT P.4 FOX EARTH SEAM DEPTH 284FT
SHAFT P.3 FOX EARTH SEAM DEPTH 190 FT. SOUGH SEAM DEPTH 237 FT.
UNDERGROUND WORKINGS
APPROX BOUNDARY OF GAS-MAKING AREA IN EACH ARRAY.
BRICK
GAS MAIN 36" DIA.
SHAFT.
DETAIL OF PILOT PLANT SHAFTS.
36" DIA. AIR MAIN
48" DIA. GAS MAIN.
WATER COURSE
36" DIA. GAS MAIN
24" DIA. AIR MAIN
36" DIA. GAS MAIN
24" DIA. AIR MAIN
SHAFT P.2 FOX EARTH SEAM DEPTH 191FT
SHAFT P.1 FOX EARTH SEAM DEPTH 136FT
SHAFT P.5 SOUGH SEAM DEPTH 315 FT

Plan of the experimental underground gasification site at Newman Spinney, near Chesterfield. The five herring-bone areas show the extent over which the pilot 'plant' extends and the area at the top left is where the C.E.A.'s generating station is being built. Near here will be seen the first multibore experiment at the bottom of No. 3 shaft.



Left, above: *Directional drilling experiments at Oxcroft colliery.* **Right, above:** *Air tubes being loaded into boreholes from the underground gallery.*

Progress in Underground Gasification

As development work continues at the National Coal Board's experimental underground gasification site at Newman Spinney, near Chesterfield, so new techniques are being tried and more knowledge of how the successful exploitation of the project will be carried out, is being gained.

So far, two experiments have been carried out on single 'blind' bore holes to work out the best means of igniting the coal in the seam, and to find out what materials should be used for the air pipes taking air to this burning coal to maintain the ignition temperature, and prevent the interruption of this air supply by the failure of the pipe by fusion. The contractors for all development work at the site are Humphreys & Glasgow Ltd., who assumed full responsibility for further development last March and, together with Sir Alexander Gibb & Partners as consulting engineers, have a third experiment under preparation. This latest experiment will be the first to try out the gasification of the coal from a multibore system, and will make use of four bores, 240 ft. long, drilled from one underground gallery in the coal seam itself. The gas will pass down the bore hole and be collected in the gallery to pass up the access shaft for steam raising at the C.E.A.'s experimental electrical generating plant.

Above: *Special reamer bit showing the three sets of cutters* **Left, below:** *Instrument hut at experimental shaft for multibore experiments.* **Right, below:** *The whole atmosphere of the experimental site is epitomised by the operator, dressed in donkey jacket, breeches and gumboots, in the instrument hut of the No. 1 experimental shaft.*

The extent to which work has been planned may be gathered from the diagram on the opposite page, which depicts the proposed bore hole systems as five herring-bone areas. These areas constitute the pilot 'plant,' which is now being prepared and the first pair should be producing gas with a potential capacity of 5 MW by December, 1958. Each pair of bore hole assemblies is calculated as having a life of nine months' useful production capacity. The N.C.B. have made available a disused district at Oxcroft colliery for experiments in directional drilling techniques. Here drilling bits and special reamers are tested.

Recovery of Sulphur from Petroleum Gases

THE FIRST OF TWO ARTICLES SPECIALLY CONTRIBUTED BY AN AMERICAN CORRESPONDENT

SINCE 1944, when the first modern U.S. installation for recovery of sulphur from sour gases went on stream at McKamie, Ark., processes of this type have become almost standard in natural gas processing plants and petroleum refineries. Today, nearly 500,000 long tons sulphur are derived from this source each year, and production volume continues on the increase.

Several factors are responsible for this sudden upsurge in the use of a process which had already reached commercial maturity during the early 1930's. On the purely economic side, the principal incentive came from the rise in the price of sulphur which rose from $16 to $18 during the early 1940's to a peak of $31 per long ton in the first part of 1956. (Prices for sulphur are normally quoted f.o.b. Gulf Coast.) Since then, the price of sulphur has again declined, largely due to Mexican competition, and this has detracted in significant measure from the favourable economics of sulphur recovery.

This increase in price was caused primarily by the rapid increase in demand with which the major source of sulphur —extraction of subterranean deposits by the Frasch process —could not readily satisfy. It has raised the value of sulphur to the point where recovery from sour gases is a profitable undertaking, while it had previously been marginal, at best.

A second factor responsible for sulphur recovery has been the difficulty which refiners experienced in procuring their sulphuric acid needs during the period immediately following 1951, when the supply of sulphur became subject to control. Locally recovered sulphur was excluded from this control and a strong incentive was thus given to the refiner for using his own resources to meet his needs for sulphur. It is interesting to note that the petroleum industry as a whole is today a net producer of sulphur. This is a reversal of the situation prior to 1950 when refiners consumed more sulphur (mainly in the form of sulphuric acid) than they recovered.

Sour Gas and Crudes

Of more current importance is the trend to the more extensive use of sour gas and crudes. In processing these streams, larger amounts of H_2S become available as a by-product and this must be disposed of both for its nuisance value and for economic reasons.

There is a fourth factor of rising importance, which is responsible for the boom in sulphur recovery activities. This is the increasing concern with air pollution, which stems from more severe anti-pollution legislation as well as from the petroleum industry's awareness of its obligations as a good neighbour in its plant community.

Thus, a rapidly declining number of installations find it advisable—or even possible—to burn their extracted hydrogen sulphide to the sulphur dioxide by flaring or, admixed with hydrocarbon gases, in the boiler house. Instead, every attempt is made to minimise the amount of sulphur which is emitted to the atmosphere in any form to the fullest possible extent.

In this respect, the needed degree of sulphur recovery—and therefore, as we shall see, the complexity of the recovery unit—depends chiefly on plant location. In general, natural gas processors and pipeline operators have their plants located in fairly isolated areas. At such sites, some flaring of H_2S is not too critical, as long as it can be kept below the point where the resulting SO_2 will do damage to crops and animals in the surrounding area. On the other hand, refineries are more frequently situated in populous centres and the demands of anti-pollution considerations is correspondingly more stringent, i.e., more complete removal of sulphur in any form is called for.

As we shall see later, the cost of sulphur recovery decreases rapidly as the size of the plant installation increases. Natural gas installations frequently have the advantage of size over refinery units for sulphur recovery. But the latter, if located near population centres generally benefit from shorter hauls to their sulphur customers, and thus from lower freight rate.

There are several means at hand to dispose of by-product H_2S. During the early 1940's, one large refiner treated this material with butane to yield thiophene. This interesting process was discontinued, largely for lack of suitable markets.

Small Market

Some methyl and ethyl mercaptan is produced today, using refinery-derived H_2S as one of the raw materials. This production is economically attractive but only a small market exists for the product. In any event neither this process nor the production of thiophene is capable of utilising the available H_2S to the point where a disposal problem no longer exists.

The really significant processes for disposal utilisation of H_2S call for its combustion to sulphuric acid or for its partial oxidation to sulphur. The former approach has long been practised but it is on the decline, while the conversion of H_2S to elemental sulphur still continues the spectacular expansion which it has enjoyed during the last decade.

Thus, the manufacture of sulphuric acid directly from sour gases in the U.S. has decreased from 265,000 short tons 100% acid in 1954 to 180,000 tons in 1956. During the same period, recovery of sulphur from H_2S rose from 357,000 to 485,000 long tons and a forecast for 1957 looks the production of 550,000 long tons in that year, 686,000 tons in 1958 (note that commercial sulphur weights are always expressed in 'long tons' of 2,240 pounds each. This is in accordance with international custom of the industry).

There are several reasons why the conversion of H_2S to sulphur is favoured over the direct production of sulphuric acid. First of all, production of sulphuric acid calls for large installations to be economic—exceeding in size the sulphur available at most recovery sites. Beyond that, burning H_2S yields water as well as SO_3, and thus results in a dilute grade of sulphuric acid. Most of the installations for production of sulphuric acid from H_2S are very large units in which hydrogen sulphide is burned together with elemental sulphur procured from other sources.

The production of sulphur is favoured over sulphuric acid manufacture for other reasons as well. Among them we must mention that markets for elemental sulphur exceed those for sulphuric acid substantially. This is particularly true of recovered sulphur, which is a purer grade than mined or Frasch sulphur.

Furthermore, investment costs in a recovery unit are less than one-third of those for a sulphuric acid plant of equal sulphur capacity. There are also fewer problems in sulphur

recovery, the efficiency in small units is about as good as in large installations, and performance is relatively stable in the face of wide fluctuations in throughput.

Still another advantage is that sulphur is stocked quite simply by pouring into blocks, thus eliminating the need for costly storage tanks required for sulphuric acid stocking. Finally, there are freight benefits in shipping sulphur rather than sulphuric acid if the acid consuming area is at some distance from the H_2S recovery unit.

Markets for sulphur show the stability of the overall economy. Sulphuric acid, which accounts for some 80% of all sulphur consumption in the U.S. is so intricately tied into the volume of the key industries that its volume is an indicator of a nation's economic level.

Thus, the 17.5 mill. short tons sulphuric acid (100% basis) consumed in the U.S. during 1956, had the following distribution pattern (1)

	mill. short tons
Fertilisers	6.3
Chemicals	4.4
Petroleum refining	1.9
Inorganic pigments	1.5
Rayon and film	0.9
Iron and Steel	1.3
Other	1.2
	17.5

The sulphuric acid demand by itself does not, however, tell the whole story. Again during 1956, U.S. industry consumed 450,000 long tons sulphur for wood pulping, 275,000 tons for production of carbon bisulphide. Some 130,000 long tons went into miscellaneous chemicals and dyes, and an equal amount into insecticides and fungicides. Rubber manufacture accounted for 80,000 long tons sulphur and miscellaneous other requirements raised total domestic consumption to 6.2 mill. long tons.

Not Major Factor

The foregoing figures are reported in terms of equivalent contained sulphur, regardless of the form in which it is employed. It must be borne in mind, that much of this becomes available in the form of sulphur dioxide (notably in the metallurgical industries) and of recoverable spent sulphuric acid (e.g., from alkylation or treating processes).

In the overall picture, sulphur recovered from petroleum sources is not a major factor. It shares in the total market to the extent of about 7 to 9%. But, from the standpoint of the individual operator, the recovery of sulphur is today often not only economically attractive, but an actual necessity for reasons set forth above.

The combined output of sulphur recovery plants did not accumulate its growth momentum until 1949. During that year, production was 85,000 long tons compared to approximately 35,000 long tons in 1944 when the first modern recovery installation was started in the U.S. Since then, output grew to 139,000 tons in 1950, 357,000 tons in 1954, 450,000 tons in 1956.

Today's operating units range from a daily capacity of 10 tons per day to more than 300 tons per day. Probably the largest unit in the world, a Canadian installation, will soon begin operations in the Pearl River area of British Columbia, where Pacific Petroleum and Jefferson Lake Sulfur Company are now jointly building a unit which has a stated capacity of 300 to 600 tons per day. In the same class is a 300 long tons per day unit operated by Texas Gulf Sulfur Co. at Worland, Wyo., and a unit of equal size at the Delaware City refinery of Tide Water Oil Company.

The marketing practice of recovery plants differs with plant size. Schwartz (2) points out that the output of small units is generally contracted for *in toto* before the plant is built. Large plants, on the other hand, compete in the open market with other sulphur sources. Especially those located close to the Gulf Coast are vulnerable to the competition of mined sulphur.

EVOLUTION OF SULPHUR RECOVERY

Today's sulphur recovery processes are based on the work of Claus and Chance in England at the turn of the century. The original work of Claus involved the partial combustion of H_2S by means of air, using a bed of bauxite as catalyst:

$$H_2S+\tfrac{1}{2}O_2 \longrightarrow H_2O+S \qquad (1)$$

This reaction is accompanied by the evolution of 53 Kcal. per gr. mole. In the original Claus oven, this entire heat was abstracted by radiation and the process became economically unworkable because permissible space velocity was only about three vols. of H_2S per vol. catalyst per hour so that a daily production of one ton of sulphur called for 250 to 300 cu.ft. of reactor space.

The first step toward removing this limitation was to separate reaction (1) into two stages:

$$1/3H_2S+\tfrac{1}{2}O_2 \longrightarrow 1/3H_2O+1/3SO_2+4/3 \text{ Kcal} \qquad (2)$$

$$2H_2S+1SO_2 \longrightarrow S+2H_2O+11.7 \text{ Kcal} \qquad (3)$$

Reaction (2) is carried out thermally at high temperature. Heat removal presents no problem. High space velocities are possible. Reaction (3), on the other hand, is carried out catalytically at about 280°C. It evolves only one-fifth the heat due to reaction (1) and effects a corresponding saving in reactor volume and heat removal requirements.

The improvement is generally credited to Bahr of I. G. Farbenindustrie who undertook supporting experimental work in 1932. It is, however, interesting to note that Hays (3) reports the existence of a sulphur recovery unit at Phillips Petroleum Company's Crane plant which reacted SO_2 with H_2S as early as 1929. At this installation, SO_2 was produced by combustion of H_2S. A subsequent venture by Phillips, operated at Judkins prior to 1935, burned product sulphur to SO_2 which was then reacted with H_2S to yield sulphur in accordance with equation (3).

Both of these plants have long since discontinued operations, but the concepts described above, find an echo in the modern processes of sulphur recovery.

The first commercial process of I. G. Farben called for splitting the H_2S stream into two portions—one-third to be burned to SO_2 which would then be joined by the remaining two-thirds at the entrance to the catalytic chamber. In a later version of the process, the entire H_2S stream is joined by one-third the stoichiometric equivalent of air. The mixture is passed into a waste-heat boiler where reaction (2) takes place. At the same time a significant portion (approx. 70%) of reaction (3) takes place. The burden on the catalytic converters, which follow the boiler, is thereby greatly lightened.

This concept is part of most commercial processes designed for use with concentrated H_2S feed. For the conversion of dilute H_2S, it is often preferred to generate SO_2 by combustion of product sulphur in a separate chamber. Illustrations of both of these methods will be given in part II to be published next week.

In petroleum practice, the reaction system is complicated by the unavoidable presence of hydrocarbons in the feed gas. In the thermal combustion stage, these hydrocarbons are burned to carbon dioxide which will react with sulphur at high temperature to yield carbonyl sulphide. This secondary reaction is objectionable not only because it depresses the yield of elemental sulphur but also because it will create an air contamination problem. (Carbon dioxide is also carried into the hydrogen sulphide stream

from H_2S recovery processes most of which concentrate both gases simultaneously.)

In sulphur recovery processes, it is therefore necessary to reverse the carbonyl sulphide-forming reactions by establishing conditions at which this product will react with sulphur dioxide:

$$2\ COS + SO_2 \rightleftarrows 3\ S + 2\ CO_2 \quad (4)$$

Thermodynamically, the right hand side of this reaction is favoured by lower temperatures. However, the reaction tends to become somewhat slow as the temperature is decreased.

Fortunately, the bauxite catalyst which serves to expedite the reaction of hydrogen sulphide with sulphur dioxide also accelerates reaction (4) effectively. Nevertheless, the latter reaction is still the slowest and special steps must be taken to effect its completion. Thus Gamson (4) finds that the conversion of carbonyl sulphide is only 93% complete at 260°C. and at a space velocity of 200, while the conversion of hydrogen sulphide is 97% complete under the same conditions.

This finding makes it necessary to operate with two catalytic conversion stages when carbonyl sulphide is present and completeness of reaction is a local essential. The first stage is operated at about 400°C. to permit completeness of carbonyl sulphide conversion at tolerable space velocities. The second reactor is run at 260 to 300°C. to complete the hydrogen sulphide conversion which is more rapid but which has an unfavourable equilibrium at high temperature. This aspect will be discussed in more detail below.

It is essential that all hydrocarbons in the feedstream be completely converted to carbon dioxide since unconverted hydrocarbons will result in carbon disposition and consequent obstruction of the bauxite bed in the catalytic converters. Where the concentration of hydrocarbons is high in the feed gas, it is therefore necessary to restrict combustion in the boiler to one-third of the feed gas, using the correct amount of air to ensure complete oxidation at this stage. The product gases are then contacted with hydrocarbon-free sulphur dioxide which may be generated by combustion of product sulphur.

Even if the concentration of hydrocarbons in the hydrogen sulphide stream is low, carbon dioxide content may be high. The reason for this is clear. Hydrogen sulphide concentration processes take advantage of the acidic nature of H_2S by absorbing this material in alkaline solutions (e.g., ethanolamines). Carbon dioxide is, however, also an acidic gas and it will therefore be extracted from the sour gas together with hydrogen sulphide. The concentration of CO_2 introduced in this manner may be quite high and will then complicate the problem by the formation of carbonyl sulphide to which we have referred.

Relief may be had in such situations by operating the H_2S concentration process with a solvent which will recover H_2S preferentially, and to the near-exclusion of carbon dioxide. Commercial processes of this type are of relatively recent origin in refinery practice. Among them we might mention the use of methyl diethanolamine, a selective solvent for H_2S in the presence of CO_2.

THERMODYNAMIC ASPECTS OF SULPHUR RECOVERY

If properly executed, the recovery of sulphur from H_2S may be as quantitative as is called for by the local conditions, even approaching 100% in complex recovery installations.

In establishing design and operating conditions for sulphur recovery units, account must be taken above all, of the fact that a low operating temperature favours the formation of elemental sulphur but that it results in low space velocity (and therefore calls for large reaction equipment).

Furthermore a lower limit is set to operating temperature by the dew point of sulphur at which this product will condense from the vapour phase. Obviously, operation below this point is not feasible because it will lead to the obstruction of the catalyst proper and of various parts of the process equipment.

In considering the thermodynamic properties of the system, it must be borne in mind that four molecular species of sulphur exist in the vapour state and that two of these—S_2 and S_6—are present to a significant extent. These species reach equilibrium with each other, with S_2 formation favoured over S_6 as the temperature is raised. Each of the sulphur species forms its own equilibrium with the H_2S reforming reaction.

From these interrelationships, there results an equilibrium curve for the reaction between H_2S and oxygen which drops from 99% conversion at 130°C. to a minimum value of 53% between 530 and 630°C. Above this temperature, conversion at equilibrium picks up again (as the presence of S_2 becomes predominant over S_6) and reaches an eventual maximum value in the 70 to 75% range. (The numerical values cited here, apply only to pure H_2S.)

The physical significance of this relationship is threefold: (1) The high-temperature reaction, which is carried out thermally in a boiler, cannot achieve more than 70 to 75% conversion; (2) process gas leaving the thermal stage must be cooled rapidly to catalytic conversion temperature in order to prevent establishment of the unfavourable equilibrium in the 450 to 650°C. range; (3) the catalytic step, used to complete the reaction should be carried out at the lowest temperature which is compatible with considerations of sulphur dew point.

This dew point is, of course, set by the partial pressure of elemental sulphur in the gas stream and is therefore a function of total pressure of the system, initial H_2S concentration, and the extent of sulphur removal prior to the final reaction stage. How these and other variables influence the design of sulphur recovery units will be discussed in the second part.

References.

1. T. P. Forbath, *Chem. Eng.* April 1957, p. 208.
2. S. Schwartz, *Pet. Proc.* September 1956, p. 115.
3. H. L. Hays and R. H. Barker, *Oil and Gas Journal*, April 26, 1954, p. 218.
4. B. W. Gamson and R. H. Elkins, *Chem. Eng. Prog.* April, 1953, p. 203.

Safe Use of Troughed Belt Conveyors

THE Central Electricity Authority has published a second safety booklet, 'Troughed Conveyor Belts', on accident prevention in the use of this type of conveyor. The problem of their safe operation is dealt with from the point of view that accident prevention measures should aid rather than interfere with their operation. It is suggested that this is achieved when operators know that they are working on safe plant and can therefore concentrate the whole of their attention on running the conveyor at maximum efficiency, and when the plant can run continuously at its full output, without having to be shut down for routine operations. The accident history and certain types of accidents associated with the operation of troughed belt conveyors are described.

The author, Mr. A. A. Beckingsale, a regional safety officer of the Authority, shows that it is possible to carry out lubrication and the clearing of spillage with the conveyor in operation, and at the same time maintain a high standard of safety. Methods for removing build-up on pulleys, both with the conveyor running or at rest, are mentioned. The need for a planned course of training for conveyor operators is emphasised and described, as is an efficient system of inspection and maintenance. It is suggested that real achievement in any industrial process rests not on the machines but on the persons planning and carrying out the work.

From a paper to the 23rd Autumn Research Meeting, London, November 19-20.

Experiments on the Production of Peak-load Gas from Methanol and Light Petroleum Distillate

By R. G. COCKERHAM, Ph.D., F.R.I.C.,

and

G. PERCIVAL,

MIDLANDS RESEARCH STATION, THE GAS COUNCIL.

SEASONAL and peak load additions to normal gas supply are generally made by increasing the flexibility of base load processes with auxiliary methods using oil. It will be agreed, however, that it would be unwise to build up the gas industry without any foreseeable alternative to the use of an imported raw material, and it is of assistance, in developing new processes for the gasification of coal, to have some idea of what the alternative might be.

The first part of the paper describes experiments indicating the possibilities of producing town gas from methanol by a catalytic process. The methanol would be produced as a by-product of a base-load process for the pressure gasification of coal. The second part of the paper describes experiments using a similar process with light oil distillates as feedstock.

Both these processes show promise, on evidence of experimental work and theoretical calculations, of providing practicable methods for making peak-load gas of calorific values up to 1,000 B.Th.U. per cu.ft. with thermal efficiencies between 80% and 90%.

Such gases could be used either for simple enrichment, or could be made with characteristics equivalent in use to normal town gas of, say, 500 B.Th.U. per cu.ft. In the latter case, the process must incorporate a stage for the removal of the bulk of the CO_2 produced, and it is suggested that hot potassium carbonate solution is a suitable absorbent for this purpose. The processes would be operated under pressure. In the experiments, pressures up to 25 atm. were used.

Using methanol, no tar or liquor is produced, and there is no discharge of noxious fumes. With light distillate, it is necessary to purify the feedstock from sulphur compounds, and special arrangements are made to avoid formation of carbon deposits.

Catalyst Essential

The production of town gas from methane is related to the following considerations: Town gas consists essentially of hydrogen and hydrocarbons, but, if its carbon monoxide content is to be low, these must be supplemented by an inert such as nitrogen to give an adequate density. Then, with regard to these constituents, while the production of hydrogen will always absorb heat, the production of hydrocarbons can be exothermic if the hydrocarbons are as methane, and the introduction of nitrogen can also be a source of heat if the nitrogen is supplied as air. The important fact is that, in the conversion of methanol vapour to town gas, the exothermicity associated with the methane and nitrogen more than counterbalances the endothermicity of the hydrogen and the conversion is exothermic overall. For town gas of a typical composition it can be expressed:

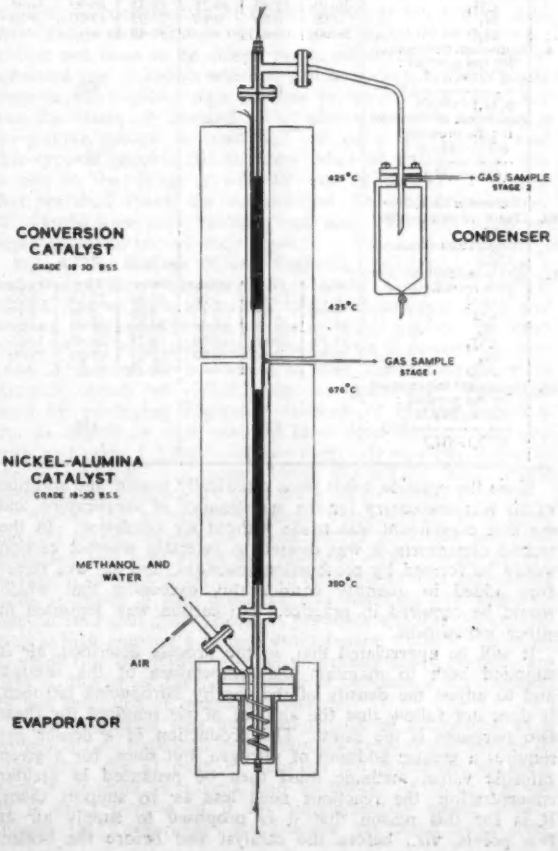
$$\underbrace{CH_3OH}_{\text{Methanol vapour}} + \underbrace{H_2O}_{\text{Steam}} + \underbrace{N_2}_{\text{Supplied as air}} \rightarrow \text{Town Gas} + 0.118 \text{ Therms per therm of gas}$$

at 350°C.

There was, therefore, the possibility of a process that, without external heating or cyclic operation, would avoid the use of oxygen, but it depended upon designing the gasifier so that the various reactions would occur together and be mutually self-supporting. It was plain that the gasifier would make use of a catalyst. Only with a fully active catalyst, as used in synthesis processes, can hydrogen be produced efficiently and rapidly from steam in the relatively low temperature range needed for methane formation.

The essential plant components are, therefore, a methanol vaporiser, a reaction vessel, boiler, carbon dioxide washer, and a gas cooler. With the plant operating under 20 to 25 atm. pressure, the methanol would be vaporised and steam and air added, the air being in the quantity required to maintain the catalyst temperature. This mixture, preheated to about 350°C., would pass continuously into a reaction vessel of the simplest construction. This would contain the catalyst as a compact bed and, since the reactions are self-supporting, there would be no elaboration for heating or cooling.

The experiments were conducted in the apparatus shown in the diagram below.



The steam for gasification was introduced by adding water to the methanol before it entered the boiler, the amount being regulated to give a gas of such composition that, in relation to the equilibrium $2CO \rightleftharpoons C + CO_2$ there was no tendency for the carbon monoxide to decompose. As a measure of safety, equilibrium with carbon in the form of graphite was assumed although it was known that with nickel catalysts somewhat higher carbon monoxide:dioxide ratios can be allowed. 0.25 lb. of steam per lb. of methanol was required.

Provision was made for samples of gas to be withdrawn from the outlet of the nickel catalyst, but the main stream flowed upwards through a layer of carbon monoxide conversion catalyst in the top part of the ½ in. reaction tube, maintained at 425°C. by the upper electric furnace. The intention was to see how far the carbon monoxide concentration in the final gas could be reduced by reaction with the steam remaining after the first stage, over a commercial conversion catalyst. The apparatus included no provision for removing the carbon dioxide produced.

The preliminary experiments were made, the results of which are given in table 1.

	Conditions	Without air addition			With air addition		
(1)	(2)	(3)			(4)		
1.	Duration of experiment (hrs.)	910			688		
2.	Steam supplied (lb. per lb. methanol)	0·25			0·25		
3.	Air supplied (cu. ft. per lb. methanol)	Nil			4·7		
	Nickel-alumina Catalyst—						
4.	Depth of catalyst bed (in.)	18			18		
5.	Temperature, inlet catalyst (°C.)	350			350		
6.	Temperature, outlet catalyst (°C.)	675			680		
7.	Gas compositions (per cent. by vol.)	Wet	Dry	Washed	Wet	Dry	Washed
	CO_2	13·20	19·30	2·00	12·10	17·40	2·00
	CO	4·95	7·25	8·80	5·10	7·35	8·75
	H_2	23·40	34·20	41·50	22·40	32·15	38·15
	CH_4	26·30	38·45	46·75	18·75	26·90	31·95
	N_2	0·55	0·80	0·95	11·25	16·20	19·20
	H_2O	31·60	—	—	30·40	—	—
8.	Equivalent temperature for the product: $\frac{(CO)\times(H_2)^3}{(CH_4)\times(H_2O)}$ (°C.)	667			676		
9.	Equivalent temperature for the product: $\frac{(CO)\times(H_2O)}{(CO_2)\times(H_2)}$ (°C.)	652			674		
	Conversion catalyst—						
10.	Depth of catalyst bed (in.)	12			12		
11.	Temperature of catalyst (°C.)	425			425		
12.	Gas compositions (per cent by vol.)	Wet	Dry	Washed	Wet	Dry	Washed
	CO_2	16·15	22·80	2·00	15·60	21·10	2·00
	CO	1·75	2·50	3·15	1·90	2·55	3·15
	H_2	27·30	38·55	48·95	26·30	35·65	44·30
	CH_4	25·10	35·45	45·00	18·75	25·40	31·55
	N_2	0·50	0·70	0·90	11·25	15·30	19·00
	H_2O	29·20	—	—	26·20	—	—
13.	Equivalent temperature for the product: $\frac{(CO)\times(H_2O)}{(CO_2)\times(H_2)}$ (°C.)	429			436		

Since the reaction tubes were electrically heated, the addition of air was unecessary for the maintenance of temperature, and the first experiment was made without air admission. In the second experiment it was desired to ascertain whether carbon would be formed by combustion reactions, and air was therefore added in quantity considerably exceeding that which would be required in practice. No carbon was deposited in either experiment.

It will be appreciated that, in the process described, air is supplied both to maintain the temperature of the catalyst and to adjust the density of the gas by introducing nitrogen. It does not follow that the amount of air required for these two purposes is the same. The production of a denser gas requires a greater addition of nitrogen, but since, for a given calorific value, methane must then be produced in greater concentration, the reactions need less air to support them. It is for this reason that it is proposed to supply air at two points, viz., before the catalyst and before the boiler. The total amount of air admitted would be determined by the gas density desired, and the proportion to the catalyst by the maintenance of catalyst temperature. A table given in the paper shows the effect on gas characteristics by diluting with air to reduce the calorific value of gas produced under varying conditions to 450 B.Th.U. and 500 B.Th.U. per cu.ft.

A thermal analysis of the process is included in the paper, and shows diagrammatically that when using methanol, based on the production of 1 therm of gas of 500 B.Th.U. per cu.ft., with a density of 0.42, the process efficiency is equivalent to 88.7% of the potential heat in the methanol supplied. Carbon monoxide conversion and CO_2 removal is included, and the process is operated at 25 atmospheres.

When a two-stage coal-gasification process is developed and established, it is believed that the cost of synthesising methanol will be sufficiently low to make the process described an attractive method of meeting peak loads. The question arose whether, meanwhile, a similar type of process could be used with the light petroleum distillate now available.

Light petroleum distillate contains sulphur compounds in quantity sufficient to poison the catalyst, and such sulphur must be removed before the vapour is passed over the material in the reaction chamber. A method is described of purifying the distillate by means of a molybdenum sulphide catalyst for converting the sulphur compounds to H_2S, followed by absorption of H_2S alkaline iron oxide.

The type analysis and composition of the purified feedstock was as follows:—

Boiling range—	
Initial (°C.)	37
Final and dry point (°C.)	72
Density (grams per c.c. at 20°C.)	0.649
Type analysis (per cent. by vol.)—	
Paraffins	99.6
Aromatics	0.4
Composition (per cent. by weight)—	
Carbon	84.0
Hydrogen	16.0

Calculating from heats of formation, it would appear that more air would be needed to maintain the steam reaction than when using methanol, so that the final gas would have a higher density. Moreover, the lack of combined oxygen in the distillate indicates the need for more process steam. It was not, however, these self-evident differences that dictated the course of experimental work: This was governed almost entirely by the finding that, compared with methanol, light distillate was much more prone to deposit carbon. When it was supplied to the catalyst at 680°C. with what on other grounds would have been suitable steam and air additions, the experimental tube blocked within an hour. The difficulty was not overcome by using greatly increased amounts of steam and, hence, was unconnected with equilibria between the gas constituents. It seemed to be concerned more with the mechanism of thermal decomposition which, with light distillate containing 5 to 7 carbon atoms per molecule, will be quite different from that of methanol containing only one atom.

It was found that the distillate could be reacted with steam without any deposition and carbon, provided the catalyst temperatures were kept within the range 400°-500°C., at which temperatures the concentration of methane was such as to make the reaction exothermic, without any addition of air.

There was, therefore, the possibility of splitting the gasification of distillate to town gas into two stages. Reaction in the first could be with steam alone at these low temperatures. Air would then be added, but only after the distillate had been converted to methane which could be safely treated in the second stage at the higher temperatures needed to obtain gas of town gas calorific value.

The apparatus used for the experiments was similar to that shown in Fig. 1, except that there was no second stage. Light distillate and water were pumped into an evaporator, the vapours passing upwards over the nickel-alumina catalyst. At 25 atm., the reaction tube was of ¾ in. bore heat-resisting steel, while for the experiment at atmospheric pressure it was of ½ in. bore silica. The space velocity at both pressures was 1,620. A third experiment was then carried out at 25 atm., in which the low-temperature stage was followed by further reaction in a second bed of nickel-alumina catalyst maintained at the temperature required to produce town gas. The apparatus now assumed the form of that used for methanol, the carbon

monoxide conversion catalyst being replaced by the second bed of nickel-alumina, except that the reaction tube was modified at the point where the air was admitted. As would be the case in practice, the air was supplied to a point where the temperature was the same as at the outlet of the first stage, namely, 500°C. To avoid carbon formation by partial combustion, air and gas were mixed at high velocity in a length of capillary tube between the stages. There was no carbon deposition and no loss of catalyst activity, and it is seen that, at the high space velocity used, the gases again assumed equilibrium composition.

Implications of the results obtained with light distillate are discussed in the paper.

The possibility of producing gases rich in methane at temperatures below 500°C. makes the first catalytic stage of interest in itself. Due to the reaction being slightly exothermic, operation is continuous and the maintenance and control of catalyst temperature becomes solely a question of evaporating the light distillate, adding the steam, and controlling the degree of preheat at around 400°C. The reaction proceeds smoothly at 25 atm., and, with such a pressure, plant units of high capacity could be designed. The experiments showed, however, that the catalyst is also effective at lower pressures and, for example, 10 atm. would be adequate if it were a question of using the minimum pressure required for carbon dioxide removal by washing with water or hot potassium carbonate. Even 1 atm. could be used and might warrant consideration for a small plant if carbon dioxide were removed at 1 atm. by ethnolamine or some such solvent.

Calculated data are given in the paper for these three pressures, and include an item indicating the high methane content of the gases produced, particularly when the reaction is under pressure. At 25 atm., the calorific value would be 833 B.Th.U. per cu.ft. after drying and washing, and at 1 atm., it is still as high as 733 B.Th.U. per cu.ft. There is, therefore, the possibility that this low-temperature reaction between steam and light distillate might have applications outside the processes considered in this paper. It could, for example, be used for the enrichment of gas from any source. It could also be used directly as a peak-load process in countries where the main supply might be natural gas, particularly if reaction to methane were completed in a subsequent stage with cooling. For the initial reaction between distillate and steam, a temperature above 400°C. appears to be desirable, but, once the distillate were decomposed, methane production could be continued at lower temperatures. Available catalysts have sufficient activity.

In the process for normal town gas, the first stage would be followed by the addition of air to attain a higher temperature at which some of the methane would be decomposed, and, as already mentioned, the amount of air required with distillate would, in any circumstances, be greater than with methanol. It would be increased still further by the separation of the initial reactions as now proposed. In consequence, there would not normally be any question of the amount of air needed to maintain reaction temperature being insufficient to give a final gas of the desired density, and so it is unlikely that any more air would be needed at the inlet boiler.

The paper also includes a table showing the reaction of light distillate with steam and air in a second catalyst stage to form a gas of a c.v. of 500 B.Th.U. under 25 atm. pressure.

The thermal analysis of this process is also shown diagrammatically in the paper and gives a thermal efficiency of the production of 1 therm of a gas of c.v. 500 B.Th.U. per cu.ft. at a density of .478 as 85.3% of potential heat in the light distillate. CO_2 removal and CO conversion are included. Methods are discussed in the paper for the production of gas of lower density if required. Such methods include (a) the use of oxygen-enriched air; (b) external heating.

DISCUSSION

Mr. J. E. Davis, O.B.E. (Chief Technical Officer, S.E.G.B.): 'If we are to give this paper its full consideration and its full weight, we should take a proper look to see where this peak-load process fits in. Our hope and aim as an industry must be to build a new industry, one for the new age. It must and can be done. It must begin right now, for a succession of gas industry research papers has already provided the basic information, and the research man has gone as far as he need go yet to enable us to make a start. Of course, he will go on; he will improve; he will find better ways. But it is not a lack of research knowledge that is holding us back. It is the practical application that still hangs fire, and in my opinion, there is not much time left. Small non-coking coal can be gasified under pressure. It has been done large-scale, 45 mill. cu.ft. a day, in Germany. We can, on the very first plant built in this country, incorporate their experience and the improvements which Gas Council research has indicated. From that we can go on to raise efficiencies at lower cost.

'The hope for the gas industry and the continuing need for its services to the country stands upon certain inherent advantages of gas as a medium for the distribution of heat energy in convenient form. Our technical task is to magnify each one of these advantages to the practical limit. What are they? First, there is the ability to convert to gas, to a common form of distribution, the potential heat of a wide variety of sources. Secondly, there is the ability to achieve a high thermal efficiency of conversion. Thirdly, there is the taking of gas from source to city at a low cost, considerably lower than the cost of moving coal or electricity. Fourthly, there is the ability to store against variation in demand. Fifthly, there is the low cost of distribution. None of these advantages has been exploited to anything like its full practical potentiality at the present time.

Storage

'This paper deals with the fourth advantage—storage, not storage to carry us over a few hours but to carry us over the seasons. The storage of fuel for winter heating is obviously necessary. Nature knows it and we know it. The cheapest way of storing fuel for the winter season is as a combustible liquid. Again and again over the years Dr. Dent has told us he believes the right use of gasification plant in the summer months is to produce a refined liquid fuel to store against the winter. Processes have been put forward, but I like the methanol alternative best, and so, I gather, do the authors. It is not a difficult operation, putting into store or taking out. The summer surplus of synthesis gas has to undergo an 8 to 1 compression in the presence of the catalyst. I imagine sulphur purification will be necessary, but it is an 8 to 1 compression, resulting in condensation of about 1/1800 of the volume, and there it stays put. It does not have to be stored under pressure; it does not have to be stored under refrigeration. It can be conveyed and stored to where it will be required. This paper gives us the requisite data on how to release that stored gas into the mains on demand. The scheme assumes a pressure gas-making process to start with. What of that? We need that type of process for its many other advantages, and this is one of the things it will do—one of several. I suggest that we shall thank the authors and the other members of Dr. Dent's team most sincerely and most effectively when we begin to make use of their work.'

Dr. A. E. Haffner (Chief Engineer, S.G.B.): 'During a recent conference we paid a visit to the Midlands Research Station and we were astonished to see the progress which had been made in establishing a station of which any country could be proud. It is an achievement comparable in physical appearance to that of the Institution of Gas Technology based in America, which we visited some two years ago. There the need for producing alternative methods of gas production is not as urgent as ours, and we have done well to catch up with and even, I think, overtake them. It was heartening to see the thought and capital being devoted to these urgent development programmes on a scale which is long overdue.

'Among the experimental plants demonstrated were those devoted to experiments on production of peak-load gas from methanol and light petroleum distillate. The concept of this scheme is in the context of future large works with gas-making units operating at high pressures, and therefore with high outputs to feed into grid systems at pressures which make generation at high pressure a natural development. Indeed, the point is made that the power costs of generating under pressure are only a quarter of the power costs of subsequent compression of gas generated at ordinary pressures.

'The suggestion that methanol should be synthesised as a by-product on base-load installation for pressure gasification of coal leads one at once to question the economics of using such a material as a peak-load feedstock, let alone the use of a small portion of it for supplementary steam raising, though Dr. Cockerham's introduction has taken away some

of the force of what I am saying. He does explain that peak-load gas can be made very cheap. But methanol is currently £40 a ton, or 3s. a gallon. If it can be made more cheaply we must sell it rather than use it.

'Technically, the possibility of a process at moderate pressure not dependent on oxygen nor requiring external heating, producing a gas free from hydrogen sulphide (but needing carbon dioxide removal) is very attractive, and the process has been elegantly conceived; but at prevailing prices for methanol is unlikely to develop. Twenty years ago a scheme was put forward for using spare water gas capacity at Beckton for producing synthesis gas for use in the subsequent winter. It was found that the capital costs involved in the expensive catalytic conversion units did not justify this ancillary plant being shut down in the winter.

'The use of light distillate is already occupying our thoughts and, indeed, has been the subject of the previous paper. The increasing availability of this material, if at satisfactory prices, is likely to lead to its being used in cyclic processes of catalytic or fuel-bed reforming and varying degrees of difficulty are to be expected with carbon formation, depending on the temperatures employed. The authors, however, choose a continuous process because of high pressures, and in doing so they have to remove the small trace of sulphur, even if it is only 0.04%. In cyclic processes sulphur is taken in its stride, because the catalyst can be revivified during the blow period and the sulphur is burnt off. Ingeniously, it is suggested in the paper that the removal should take place while the material is being put into storage during the off-peak season in order that the feedstock could be used for peak-load purposes without pre- or post-purification. The steps taken to avoid carbon deposition by operating a first stage between 400°C., when the catalyst is just active enough, and 500°C., when it becomes active enough to lead to carbon deposition, followed by a second stage after air admission at 700°C., are very interesting. The suggestion of adopting two stages at different temperatures to avoid carbon deposition is likely to be successful in cyclic catalytic plants as well, during the transition conditions before the new processes come into action.

Low Pressure Process

'Not all the work has been carried out at elevated pressures, and there is attraction under prevailing conditions in the simplest version of a one-stage continuous process operating at temperature below 500°C. in which the operating conditions are determined by control of the rate of evaporation of the light distillate, adding steam and controlling preheat to about 400°C. This gave a gas of 600 B.Th.U., even before ethanolamine washing. Such a low pressure process may well compete with cyclic catalytic or fuel-bed reforming plants for peak load production, particularly since the peak load purification has already been covered by previous sulphur removal from the feedstock. Until we can take it from the present programme and apply it to prevailing conditions, the real value of this paper is in its vision for the future.'

Mr. T. S. Ricketts (Chief Engineer, S.G.B.): 'The use of methanol for the production of peak-load gas will be new to most of us, and I for one shall be very interested to hear in due course more about its synthesis. The authors mention that synthesis gas of suitable composition will become available in a two-stage gasification process, and this may mean that the Lurgi process in its present form is not very suitable. Perhaps they would give us more information on this point.

'I am glad that the carbon monoxide content of the gas produced from methanol can be reduced to a low figure, and this is in accordance with the composition of gas produced from any of the pressure gasification processes when using a suitable conversion stage. In considering the economics of manufacturing gas from methanol on a practical working scale, it seems that heat recovery will become of great importance. I am not sure whether greater heat recovery could be obtained under working conditions. Perhaps the authors could tell us that.

'I am one of those people who do not like to feel that the gas production process depends too much on an imported fuel, and for that reason I welcome the introduction of methanol as a source of supply. The possibility of producing and storing large quantities of this fuel from the coal gasification process during the summer for use during the winter is one that appeals to me. The authors believe that the cost of synthesising methanol may be sufficiently low to make the process an attractive method of meeting peak loads. They compare this process with the employment of underground storage as an alternative means of meeting peak loads. Both methods—underground storage and the production of gas from methanol—have one point in common and that is the ability to place into stock during the summer months a fuel which can be produced at practically materials cost only, since both plant capacity and labour are normally available and to spare during the summer months. This, then, is one advantage which cannot be shared by light distillate, since this fuel is usually bought on a contract basis throughout the whole of the year. Whether peak-load gas produced from methanol could in fact compete with underground storage I do not know. I have attempted to calculate the economics of underground storage which may become available in Scotland and if, as we hope, a capacity of some 1,000 mill. cu.ft. should become available, then it seems to me that the cost of placing this gas into storage would amount to something like 2d. or 3d. per therm, taking it from orthodox production and using compressing plant.

'This gas would be placed into storage during the summer time and would, strictly speaking, only cost something like 6d. per therm, since labour and plant capacity would be available during these months. If it comes from a Lurgi process, it might be said that we therefore have a total cost of 8d. or 9d. for this volume of peak-load gas to be made available during the winter. If it comes from a Lurgi plant, it will be less, because there will not be any compression cost. Whether gas produced from methanol could compete with these figures I do not know, but in any case the volume of underground storage available is strictly limited.'

Change Must be Made

Mr. M. Redman (N.T.G.B.): 'The time is fast approaching when a start will have to be made upon the process of gradual change from existing gas production techniques to new ones. It is therefore essential at this time to develop not only the more complex base-load processes but also peak-load processes. The required characteristics of each can already be closely defined. Base-load plants need to operate under pressure, since it is then cheaper to transport the product rather than the raw material; they need to produce cheap, clean, compatible gas of low toxicity, and they need to be capable of using any coal or oil feedstock, particularly coal which is our main indigenous asset. We have only recently been able to produce compatible peak-load gases in atmospheric pressure processes and we cannot any longer tolerate wide variations in gas composition in our future plans. For peak-load processes, operation at as high a pressure as the base-load plants, say 20 to 30 atmospheres—may not always be required, for some decentralisation of peak-load units might be envisaged to reduce grid main costs. The authors have shown that their process is suitable for low pressure, but it might well be found that any gains from low pressure working are more than offset by the loss of the important advantages of the high specific output possible when operations are conducted under pressure.

'In a system supplied by gas made entirely by these pressure processes one may envisage an arrangement whereby liquid fuels or other chemicals are synthesised in the summer off-peak period, together with some methanol for the greater part of the year. Daily or weekly peaks can be met with the methanol gasification process in winter, but what of hourly peaks? Here storage has doubtless still an important part to play and when one remembers that when the gas is already available under pressure the compression cost of operating high pressure storage installations is small, it becomes apparent that the time is now opportune to study the engineering problems of gas storage at higher pressures than we have yet contemplated. The cost of such plant would need to be balanced against that of stand-by peak-load gasification installations, which might well be as cheap and would in any case be necessary, because it is a fault of plants with high specific outputs that should they fail the percentage loss of production is too great to ignore as a factor in supply failure. One might consider, however, two units operating at half load so that in the event of one failing the other would assume full output. Unfortunately the correct locations for storage and peak-load gas production are not always likely to coincide. In these thoughts, I am, of course, assuming much greater sales of gas than now apply, and this

would be expected to involve the erection of some extra storage capacity.

'There appears to be no mention of whether any unconverted methanol passed the reaction tube at the space velocity chosen. If there was none and 100% yield was obtained, then presumably the space velocity could be increased further, although high slips would no doubt cause costly losses on the large scale.

'Perhaps the authors would tell us whether other steam/methanol ratios were tried, since it is stated that there is some latitude above the carbon deposition point. While there is shown to be excess steam, and this is used for CO_2 removal, this steam is perhaps more properly a charge against gas washing, although if it must be used on this account, advantage might well be taken of its presence in the reactor and shift converter.

'There appears to be a calorific value limitation of around 600-650 B.Th.U. per cu.ft. at 0.25 lb. steam per lb. of methanol. Perhaps the authors would like to comment on this matter, since should declared calorific values be raised ultimately, to take advantage of hydrogenation processes, this figure of 600-650 B.Th.U. would impose a ceiling.

'It is interesting to note that no carbon deposition was observed on the nickel alumina catalyst and the question arises whether this was also the case with the CO conversion catalyst at the steam/gas ratio employed and the ratio of CO^2 over CO_2. Perhaps the authors would say whether there was any free iron present in the conversion catalyst.

'Table 6 shows experimentally that methane reforming is taking place at 632°C., whereas greater temperatures are normally required in commercial reformers, at least for substantially complete reforming. Perhaps the authors would say whether this performance is due to the activity of the catalyst, coupled with the reduced degree of conversion.

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'It is interesting to observe that the steam and air reforming part of the scheme described in page 2 is already standard practice in the American ammonia industry at a pressure of 10 atm., which helps to bring an effective reliable process, based on light distillate, much nearer. One might consider, after an intermediate pilot plant stage, a peak-load process based on light distillate and so designed to utilise methanol at a later date, when base-load processes are constructed. A peak-load process with a thermal efficiency of 85% is certainly a big step forward and with both feedstocks pure carbon dioxide is produced, for which attractive outlets could well be found.'

Mr. N. H. Williams (Humphreys & Glasgow Ltd.): 'Time has not been available to make either a full process study or an engineering design study of the proposed processes and equipment, but I think it can safely be said that in general the equipment and process controls required are basically simple and straightforward, with the possible exception of the addition of air or enriched air to the hot gas between stages one and two. Thought is certainly required here, particularly in relation to operation at variable output.

'The work on methanol looks ahead to a gasification system based completely on coal, and it should be regarded from this point of view. I have little doubt, however, that while a light distillate is available at a suitable price as a result of refinery operation, its use would be preferred to that of methanol specially synthesised for the purpose. When synthesising methanol, the capital charges on the basic gas production plant would not have to be borne by the methanol synthesis process, because they would only be used for such synthesis when the works was below full load. Additional equipment would, however, be required for adjusting the composition of the gas as well as the compressors and methanol synthesis plant which normally account for about 35% of the cost of a synthetic methanol works, excluding equipment for removing higher alcohols which in this case would presumably not be necessary. There would thus be appreciable capital expenditure chargeable directly to peak load.

'This leads me to wonder whether it would not be wise to give attention to the use for peak-load gas-making of a product which would in any case be available from a completely coal-based works, namely benzene. Normally, it would pay to sell this. However, it is well established that a peak-load process can afford a more expensive fuel than a base-load process, provided the equipment costs for gasification are low. I realise that benzene is a much more difficult material to use by the process described in the paper than either the type of P.F.D. with which the experiments have been conducted or methanol. However, types of P.F.D. now on the market are quite appreciably aromatic in character, and it is these types which we must anticipate in the future. I would therefore like to ask the authors whether they have any information relating to the gasification of benzene in the type of process which they have described.'

Mr. E. Rose (Tottenham Divisional Engineer, E.G.B.): 'There is a demand now for the use of light distillates. In some parts of the country it is cheaper to make base-load gas from light distillates than from coal or any other process. If the process is cheap and adequate plant is cheap, there is no reason why we should always call it a peak-load process. If we use it as a base-load process, the manufacturers of plant may not get very fat, but there is no reason why we should not use it. There are a good many parts of the country where we may be faced with having to extend plant or review the plants we have as a background for centralised pressure gasification plants. We have talked of a national grid, but we have to wait for that. A lot of work still has to be done—several years of work.

'But light distillate is available now, although—as Mr. Davis has said—it may not always be available. Oil companies have talked in terms of something like ten-year agreements. This process has been talked of as a peak-load process, but no one as yet has mentioned the load factor on the grid. It would be perfectly reasonable in distribution practice to place the peak-load plant at the terminal end. Therefore, the development of this process makes an opportunity for placing plants, if they can be developed, at the terminal ends of a future grid-to-be, placing them now in the next few years before the existence of the grid, before the base-load plant is in existence. In this way we might be able to provide base load at very reasonable cost to cover us over the interim period until we can get nicely integrated up to our pressure gasification plants. This process, as we see it, is now neat, clean and tidy.

If Supplies Fail

'The only way we have to deal with low distillate at the moment is in cyclic plants, the efficiency and reliability of which can never equal those of a continuous process. On top of that we have imported methane just round the corner; a number of us have been thinking how we are going to reform that. One is left with two points: That you would much rather have a continuous process than a cyclic one, and what happens if the ship gets stuck on the Goodwin Sands? You have to find some light distillate and work it in the same plant. What do the authors think are the possibilities of using this two-stage process for light distillate or half of it for imported methane? If we were able to do that, some of us might be able to solve some of our immediate problems.'

Mr. W. N. N. Knight (British Petroleum Company): 'The authors say they do not know what the effect of raising the end point of the feedstock is going to be, and I notice the end point of the feedstock is pretty low—about 80°C. As Mr. Davis has said, the nomenclature has changed from P.F.D. to L.G.F., and with that I think the end point has risen. Although L.G.F. may have an end point of 80°C. most of the time, it is quite possible that material supplied under these initials may have a considerably higher end point, possibly 120°C. We should be very interested to hear what would be the result of using such material. Dr. Cockerham may say that it will result in an increase in carbon and more steam, and that may reduce the thermal efficiency of the process. Perhaps he could give us his views.

'On the desulphurisation step, it had been said the cost was about 5% of the cost of the feedstock. The authors might have had an optimistic set of accountants. I should have thought it would cost rather more, but it depends on the basis of the costing.

'Reference is made to the use of molybdenum sulphide with alumina. We in the petroleum industry have considered mixing cobalt molybdenum with the sulphide catalyst. The authors have very little sulphur to remove, but even so with a more efficient catalyst they may be able to reduce the size of the catalyst or the temperature or some such thing which will give a better efficiency of operation.

Mr. G. Percival, in replying to the discussion, said: 'It is particularly encouraging to us to know that the men at the

wheel are almost alongside us in our efforts to put forward these ideas. They can be happy in the knowledge that their interest stimulates us in our work.

'It is a fact that we should be happier with a two-stage type of gasification process for the manufacture of methanol. The point was raised by Mr. Ricketts, and the point that underground storage is limited is also important, because these liquids could, of course, be stored above ground. As far as experimental results are concerned, there was no methanol slip in the experiments described. We did not investigate the effect of increasing to the point of slip. We were running the catalyst well within its capacity and although we investigated this for light distillate, while we found slip occurred at temperatures below 350°C. at which temperature the catalyst activity would seem to be permanently affected, we did not do so in the case of methanol. Nor did we try the effect of using other methanol/steam mixtures. In this case the steam addition was really a safety measure. It is very likely that the process would work with a small proportion of added steam.

'The point about the calorific value limit under the conditions in which the methanol experiment was carried out is quite true. But of course once this initial stage is over, one has thereafter to operate a second stage at a lower temperature to operate a second stage at a lower temperature to bring the calorific value up as high as one likes. In particular processes we reported in the case of methanol we placed a ceiling on the C.V. for the purposes of the report. But a second stage working at lower temperatures would allow the methane concentration to be raised if necessary. There was no carbon deposition on the carbon conversion catalyst, and there is certainly no free iron in the raw material, the material as charged. Work has been done with this same catalyst in other programmes for the production of hydrogen, and I can easily find out whether there is free carbon in the material from this other work. I shall be only too glad to pass on that information.

'On the point about the reformation of methane at 632°C., we were not really reforming the methane, only to the extent that we required to produce gas with the required C.V. Frequently in plants which are reforming methane as far back as possible, it is not really the activity of the catalyst which is the trouble. It is the difficulty of getting the heat there. It is this difficulty of heat transfer which often appears as a limitation in catalyst activity.

'The cost of methanol has been mentioned, and we do regard this material as very much in the future, when conditions may be different. But nevertheless we have made some steps towards trying to assess what the cost would be when associated with a base-load plant. We have not at the moment investigated the use of benzene in this type of plant. Therefore, we have no experience whatsoever, but we certainly feel it would be more difficult to operate than with light distillate.

'With regard to the remarks about boiling point with light distillates, we are unsure of the type of material which we could expect from the oil companies. We have used one product and in an earlier paper it was said that 3 mill. gal. of this particular material had already been used in experiments. But what we should be interested to get is the type of material which we may expect in the future. We find it difficult at the moment to have any definite information on this point.'

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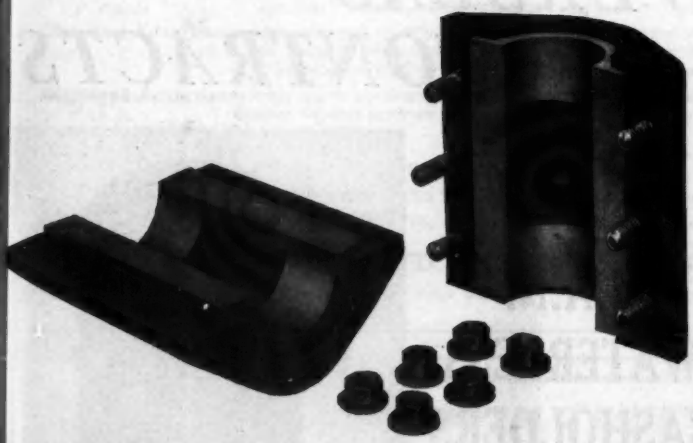

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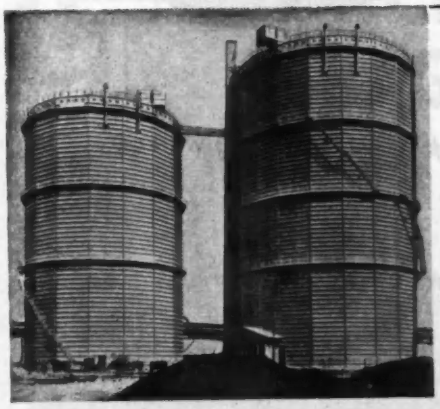

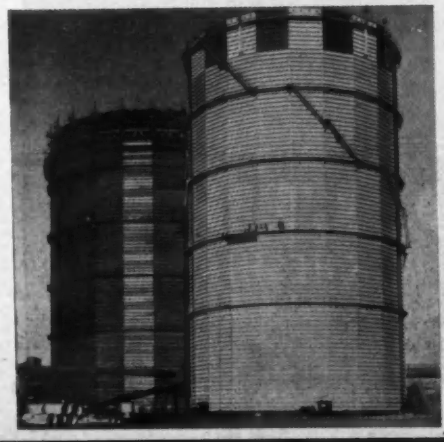

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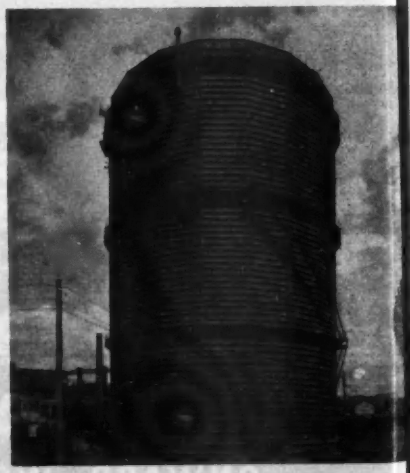

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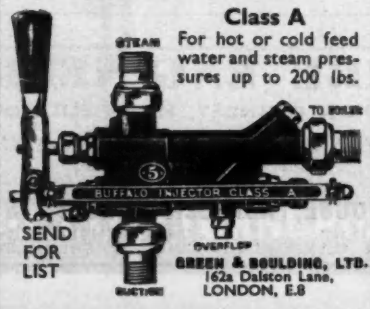

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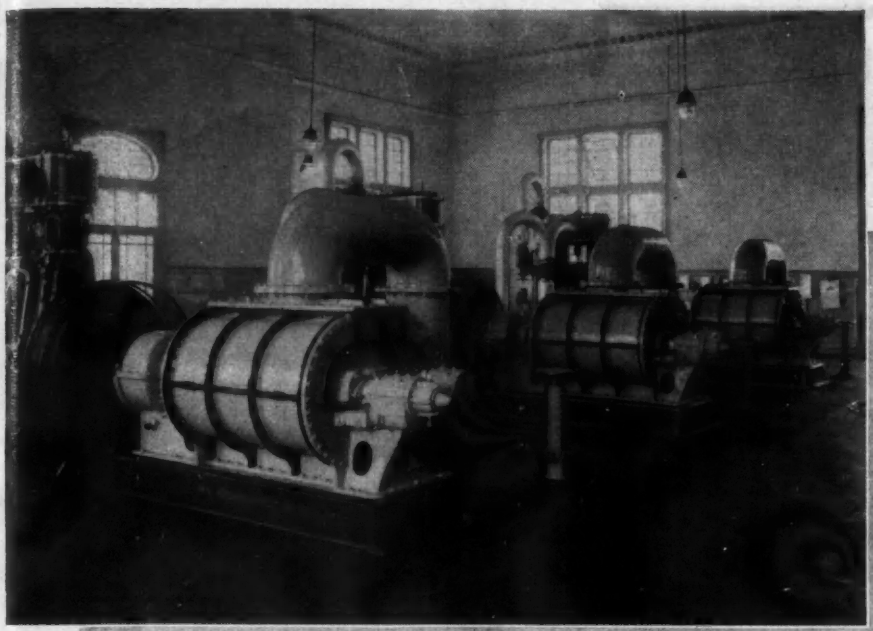

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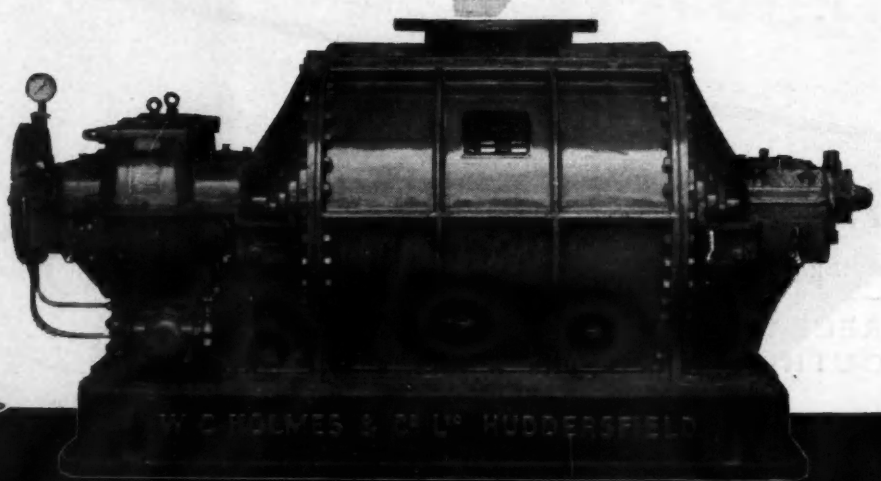

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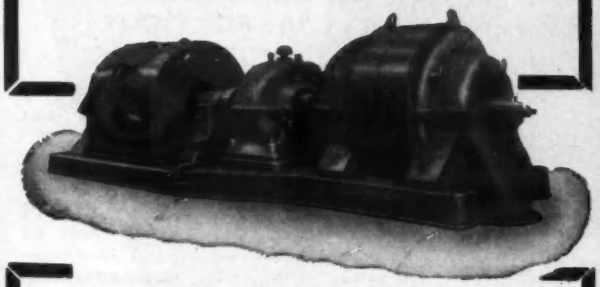

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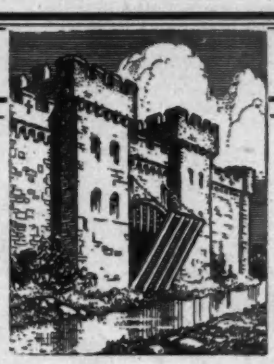

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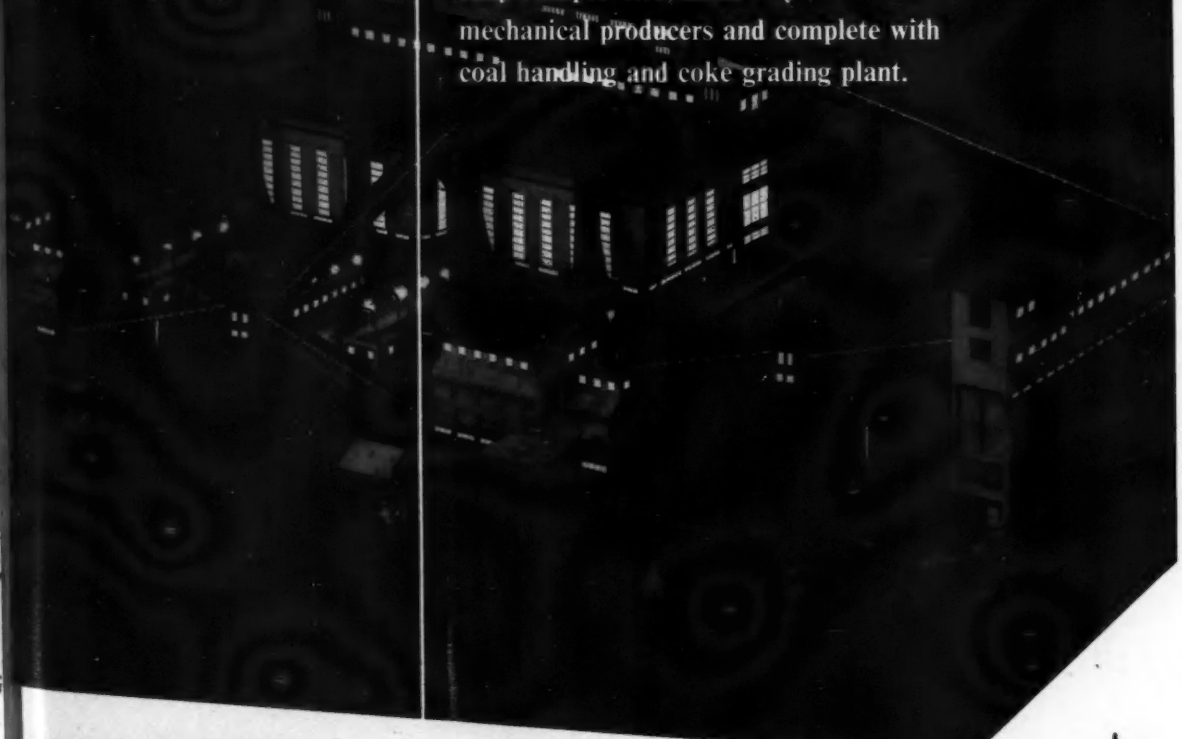
Sunderland's new 8,000,000 cu. ft.

C·O·L PLANT

The new installation of C.O.L. Intermittent Vertical Chambers to be built at the Hendon Works of the Northern Gas Board at Sunderland will have a nominal daily capacity of 8,000,000 cu. ft of gas.

Like the Board's large C.O.L. plant at Howdon, shown here by night, the installation will consist of 72 chambers, fully recuperative, heated by mechanical producers and complete with coal handling and coke grading plant.



WEST'S GAS IMPROVEMENT CO. LTD (C.O.L. DIVISION)

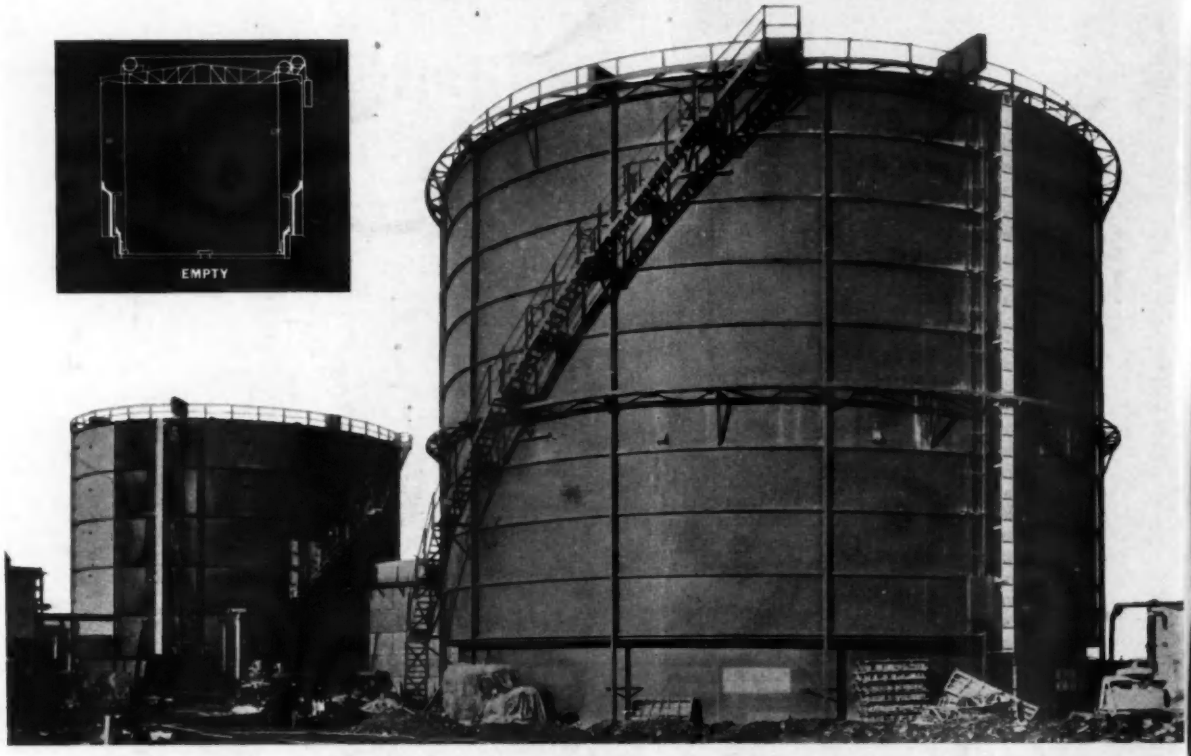
CHANDOS HOUSE, BUCKINGHAM GATE, WESTMINSTER, LONDON S.W.1

TELEPHONE: ABBEY 6912

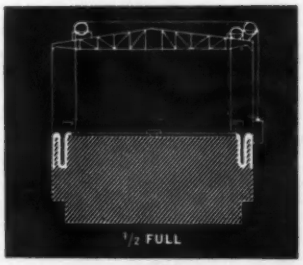
HEAD OFFICE: ALBION IRONWORKS, MILES PLATTING, MANCHESTER 10. TELEPHONE: COLLYHURST 2961

Wiggins

DRY SEAL GASHOLDERS

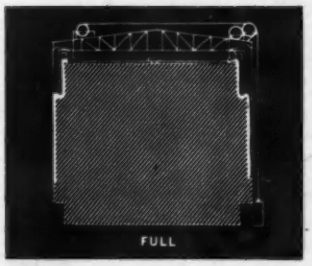


Two Wiggins gasholders each 1/4 million cu.ft. capacity.



Foreground : Storing methane for the National Coal Board at the Point of Ayr Colliery.

Background : Storing reformed gas for the Wales Gas Board at the Point of Ayr station.



ABP

ASHMORE, BENSON, PEASE & CO

(MEMBER OF THE POWER-GAS GROUP)

STOCKTON-ON-TEES AND LONDON

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